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EIGHTH ANNUAL REPORT

OF THE

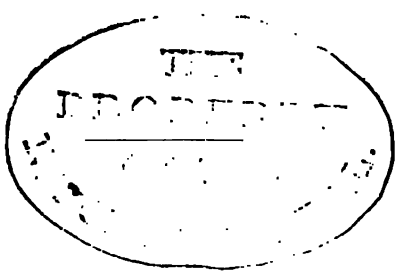
STATE BOARD OF HEALTH

OF THE

STATE OF NEW HAMPSHIRE,

FOR THE EIGHTEEN MONTHS ENDING

OCT. 31, 1889.



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28757

REPORT.

To His Excellency the Governor and the Honorable Council:

The eighth annual report of the State Board of Health, herewith presented, is made to embrace the period between May 1, 1888, and October 31, 1889, inclusive. This change is made in order that the fiscal year of the Board may hereafter terminate October 31, that the report may continue as nearly as possible to the time of the meeting of the Legislature, which will hereafter convene in January. The large amount of work devolving upon the Board early in the year rendered it impossible to issue a report in season for the last Legislature; hence the Board has deemed it best to bring the present report to the last of October, instead of making the change next year.

A report of this character must necessarily be very incomplete, so far as it represents the actual work undertaken and accomplished, for a detailed account of matters coming to the attention of the Board, the correspondence, etc., would constitute a large volume which would have little practical interest for the public, and would convey little, if any, instruction in sanitary matters; yet each act is of importance to the persons or communities directly interested, and also has its place in the general sanitary progress of the State.

During no other period of equal length in the history of the Board has its work been so exacting, or the demands made upon it so great. Appeals have been received from the individual citizen, from the family, from town and municipal authorities, and from private corporations, all in the direction of sanitary improvement.

The Board has also exercised a general supervision over the sanitary welfare of the State, and has suggested and brought

about reforms tending to advance the public health interests of the locality in particular and the State at large. The Board has heartily co-operated with local health authorities, as well as with individuals, in their efforts to better the sanitary conditions of their respective localities. This great mass of work, which has almost constantly engaged the attention of the Board, will not be represented in this report. In a general way, an idea of the magnitude of the work may be obtained by a perusal of the annual reports.

SANITARY PROGRESS.

We believe that New Hampshire, in sanitary matters, is keeping pace with the other States of the Union that have active boards of health, and we are decidedly in advance of the few States which have no such organization. No branch of the public service has made greater advancement in the past few years than sanitary science; and this progress is very largely national in its scope. The time has come when the people are no longer panic-stricken at the mention of yellow fever or cholera, and this change of sentiment is wholly due to the knowledge that health authorities are competent and able to restrict and control those diseases which once raged in frightful epidemics. Health authorities of to-day fully understand the nature and character of most of the pestilential diseases; hence there is a public feeling of security that exerts an extended influence over every-day life, and even commercial and industrial enterprises. Our ports are now open to communication with all parts of the world, and the "forty days'" quarantine is a thing of the past. Even the great water highway of the South and the West — the Mississippi river — is open to commerce, under modern methods of sanitation, almost without restriction, even though vessels infected with yellow fever and cholera arrive at New Orleans. The appearance of a cholera-stricken ship in New York harbor is of scarcely sufficient importance for newspaper comment, and does not in the least alarm the people, owing to their confidence in the sanitary supervision of the port. Certain it is that every hamlet in the State, as well as every city, may secure immunity from the ravages of contagious and infectious diseases if it will but avail itself of the pro-

tection offered by sanitary science. In many towns of our own State sanitary knowledge has been applied in the management of affairs with marked results from year to year, and we regret that this cannot be said of all. There are people so fixed in the ruts of habit and daily practice that it would seem that nothing short of an upheaval of nature could move them in the least. We are glad to say that only a small minority of our towns are under such management; and we have an unbounded faith that the rising generation, seeing the progress of other towns, will bestir themselves to wash out the sins of their fathers. Most New Hampshire towns are enterprising, and fully realize the importance of sanitation, and to this end have established local boards of health, constructed sewers, looked well after their water supplies and the condition of their schoolhouses, and have accomplished much for the good of their respective communities.

REPORT OF CONTAGIOUS AND INFECTIOUS DISEASES.

The Board requires monthly returns from the local boards of health, of the prevalence of contagious and infectious diseases, particularly diphtheria and scarlet fever. These returns, as a rule, are quite promptly made from a majority of the towns. The system of notification now in practice in this and other States is of special value in the restriction of this class of diseases. The physician promptly notifies the local board of health upon the outbreak of either of these diseases, and the latter immediately takes such action as is necessary to prevent its spread.

Theoretically this is what a system of notification brings about; but practically it is not carried out in all of our towns. Whenever this method is enforced strictly in accordance with this intention, great practical results are accomplished, as has been observed in several towns in the State. So marked have been the effects in some places, that there can be no doubt of the efficiency of the method. If all the towns in the State would carry out this plan in accordance with instructions furnished them by the State Board, there would be a very marked diminution in the number of cases of contagious and infectious diseases. But the spirit of inaction which pervades some towns in the management of all their public affairs, is in no degree lost in the presence of scarlet

fever or diphtheria, and hence these diseases are not infrequently disseminated, simply because no effort is made to check them.

Enough has been done in this State by the local boards of health to show that these diseases may be effectually restricted and stamped out by the action of competent local health authorities. This fact having been repeatedly demonstrated, we assert without qualification that every town in the State should have an efficient health officer or board of health. As it is, much effectual work is being done, much more than that accomplished in years past; so we are able to record a decided advancement in this direction.

DISEASES OF ANIMALS.

During the past year we have investigated several outbreaks of diseases among animals in different parts of the State. Numerous applications for investigation have been made to the Board. Many of these cases were of a character that did not demand any investigation on the part of the Board, as the facts presented did not warrant a further examination.

We have, however, received complaints of diseases among animals of a very grave character, to which the attention of the State should be directed. Indeed, this matter was considered by the last Legislature, and a law enacted which, if faithfully, impartially, and scientifically enforced, may result in much good.

There has been no contagious or infectious disease among the cattle of the State during the year, of a character dangerous to man, except tuberculosis, and possibly a few cases of glanders. Tuberculosis has been found in several localities, and its prevalence is doubtless much greater than has been supposed. It is a disease that should be eradicated by the most aggressive measures that can be taken, not only for the protection of the farmers of the State, but for the health of all our citizens. The identity of tuberculosis in animals and man is well established, as well as the fact that it may be directly communicated from animals through tuberculous meat and milk to the human family. In another part of this report may be found a more extensive discussion of the subject.

SCHOOLHOUSES.

The attention which this Board has hitherto given to the subject of schoolhouse sanitation has, we believe, resulted in much benefit to the State. The law of 1885, adopting the town system, necessitated the building of many new schoolhouses, and the remodeling and reconstruction of old ones; and in this work in many places we have observed the results of the teachings of this Board, while not a few towns have applied for specific instructions in building.

The subject of ventilation has been especially considered by building committees, and even in some very small district schoolhouses, some system of ventilation, of more or less utility, has been adopted. The importance of proper ventilation, lighting, heating, etc., of our schoolhouses is better understood and better appreciated by the public at the present time than formerly, hence we have, as a State, made considerable progress in schoolhouse sanitation, which, although not as marked as it ought to be, is, perhaps, as much as we could expect under the circumstances. The small, unventilated schoolroom, heated by an air-tight stove, and with pupils facing the windows, is still to be found in more than one locality, and perhaps will be until the millennium; nevertheless, the fine school buildings which are now in process of erection in Concord, Portsmouth, and many other towns that might be named, indicate that schoolhouse construction and sanitation are making creditable advance in this State.

In comparing the present state of public health interests and practical sanitation with that which existed even five years ago, we are able to record very marked progress; and we have reason to expect that sanitation will accomplish more in the next few years than it has in the past, because the subject is being more generally and thoroughly understood by the public from year to year.

There is nothing more essential to the advancement of public health interests than that the entire people thoroughly understand the possibilities of sanitary science. When every family in the State possesses that amount of sanitary knowledge which may become common to all, and which is now well understood by many, we shall expect an advancement in the restriction of

disease, the lessening of mortality, and the general prosperity of the community. Our people are well on the road to such knowledge, and it seems to this Board, that through a continuation of the practical teachings of sanitation which are presented by executive work of efficient health officers, and through a general diffusion of sanitary knowledge, our State may reap substantial benefit, which will be demonstrated by practical results in every town. We are, to-day, surely advancing toward such results.

CO-OPERATION OF THE MEDICAL PROFESSION IN SANITARY WORK.

The medical profession in New Hampshire as a profession are thoroughly interested in sanitary work, and are doing much good by educating the people in the restriction and prevention of disease. The physicians of the State support and supplement, in a very large degree, the work of the State Board of Health, and many communities are under deep obligations to the philanthropic labors they are performing in addition to the actual practice of their profession. We can call to mind many intelligent members of the profession who lose no opportunity to impress upon the people the importance of sanitary work, and who instruct and educate them in the measures necessary for the prevention of disease or the restriction of its spread. Such efforts as these are to be commended from every standpoint, and especially so when it is remembered that such a course is in direct opposition to the financial interests of the physician. They take the most active measures possible to prevent the spread of an infectious or contagious disease, using disinfectants and germicides in a rational and scientific manner, isolating the patient, and performing many other duties in the line of preventive medicine which, even a few years ago, were not in vogue in medical practice. There are many in the practice of medicine, it is true, who give no attention to these matters, but they are among that class that can be found in every quarter, several years behind the times; but the intelligent, progressive men of the profession are as much interested in sanitary progress as in medical and surgical advancement.

LOCAL BOARDS OF HEALTH.

The majority of the towns in the State have local boards of health or health officers, while in the remaining towns the selectmen are *ex officio* a board of health. Many of the latter class are complete failures as boards of health, for two reasons: First, they are totally unfitted for the performance of the duties devolving upon a health officer; and second, they have no interest in the work. We believe that the law should be changed so that it shall be compulsory upon every town to provide a board of health or health officer, and such board or officer should be appointed rather than elected. If such a course were followed, more or less work in the interest of public health would be accomplished in every town. An efficient health officer is as necessary as a board of selectmen; the work to be performed in the restriction and prevention of contagious diseases alone, warrants this assertion. In many of our towns the health authorities are active, vigilant, intelligent, and ready to perform every duty that may come to them; in these towns we have witnessed a very marked sanitary advancement; infectious and contagious diseases are controlled, and the towns are cleaner and more healthful. These boards cooperate with the State Board of Health in every measure proposed for the good of the locality, and many of them inaugurate and carry out improvements without the order or advice of the State Board. A much better health service is being secured in most of our cities than heretofore; Concord, Manchester, and Keene have efficient health departments, while Dover and Nashua are already taking action to secure better health service in those cities.

PUBLIC WATER SUPPLIES.

The increase in the number of public water supplies in this State during the last five years has been very noticeable. At each session of the Legislature, charters have been secured for new water-works; at the last session charters were obtained, or old ones amended, for public water supplies in the following towns: Berlin, Derry, Boscawen and Penacook, Hampton, Portsmouth, Canaan, and Tilton and Northfield. The water supplies of several cities and towns have also been enlarged and improved.

Among such operations worthy of special mention are the extension of the water supply at Dover and the introduction of a very abundant supply into Tilton.

In no way can the health of the people of the State be better guarded than by securing an abundant supply of uncontaminated water. An improved condition of the general health of the people has frequently been observed in towns, immediately following the introduction of a public water supply and the abandonment of surface wells. This Board has constantly urged upon the public the importance of a good water supply for every town, and pointed out the dangers arising from shallow wells; the result of such teaching may be observed to-day in many towns. The Board has caused the analysis of well waters in many sections of the State, the results of which have plainly shown their great dangers; so that our wells are to be looked upon with suspicion, and, indeed, many of them are perilous to the health of the persons using the water from them. These facts have been very forcibly brought to the attention of the people in the localities where the examinations have been made, thereby greatly enlightening the public in respect to the dangers of water pollution. A more detailed account of this work is to be found in the report of Prof. E. R. Angell, in another part of this report.

SEWERAGE AND DRAINAGE.

The sewerage and drainage of towns is a subject which is closely connected with the introduction of a public water supply, and one which, after an abundant water supply has been brought into a town or city, demands immediate attention. Many towns have made a very respectable beginning in this direction, with a view to finally completing a system ample for the needs of the locality. A majority of them do not feel able to construct a complete system of sewers in one year, hence it is built by piecemeal. Most of the towns have commenced this work upon a systematic plan, and when finished a perfect system will be secured; other towns, with less foresight, have constructed short sewers to meet the immediate demands of the locality, without any reference to a regular system.

The work of sewering our towns as a whole is probably in

keeping with the general sanitary progress that has been made in the last few years, although there are some noticeable exceptions to this rule. The construction of sewers occasions a considerable outlay, from which no money dividends will be received; hence it is sometimes impossible to secure a vote of the town for an appropriation sufficient to carry on the work. Among the larger towns of the State which sadly need such a system are Laconia and Rochester, particularly the latter.

ALMSHOUSES.

The Board has made an inspection and examination of all the county almshouses in the State during the year, and detailed reports upon these institutions may be found elsewhere. In a general way we would say that the county almshouses have been very much improved so far as their sanitary appointments are concerned, since the Board first commenced this kind of work. It is a pleasure to state that in most of the counties the board of county commissioners has cordially co-operated with the State Board of Health in its efforts to better the condition of these institutions. In some counties these improvements have been very marked, and their almshouses are now in a condition that may be classed as excellent; while in some other counties, although more or less work has been done from year to year, there is yet need for further action. As a matter of course, in all these institutions there must be some repairs and changes each year; but when they are once placed in the best possible condition, the annual expenditures for repairs and alterations are reduced to the minimum. Work that is well and substantially done requires but a slight annual outlay; but a defective construction, as plumbing without traps, or sewers imperfectly laid, or steam-heating with insufficient boiler capacity, etc., will, as a result, demand large expenditures each year. Some have had this very experience, and it has proved very expensive; one or two others have this problem yet in hand, and will of necessity be obliged to expend considerable money in the next year or two for repairs.

On the whole, our almshouses are ample to meet the wants of their respective counties, are well managed, and make most excellent homes for this unfortunate class.

"SANITARY VOLUNTEER."

The "Sanitary Volunteer," a journal devoted to the interests of healthful homes and communities, published monthly, was commenced in January last, and is issued as the official organ of the New Hampshire State Board of Health. The subscription price was placed at fifty cents a year, which, with the income derived from a few advertisements, it was thought would be sufficient to pay for the printing and distribution of the journal, and it was confidently hoped that it would aid in advancing the public health interests of the State. It was designed to supplement and aid the work of the Board, and we believe that it has thus far fulfilled these expectations. The editing of the journal has placed considerable additional work upon the secretary, but ample compensation has been received in the many words of appreciation spoken of it, and in the belief that it is of some service to the public. The additional work imposed upon the Board by making it a Board of Commissioners of Lunacy, will necessitate the suspension of the publication of the journal at the close of the year, much to our regret.

COMMISSIONERS OF LUNACY.

The act of the last Legislature, making this Board a Board of Commissioners of Lunacy, has very largely increased our duties and responsibilities. Although the creation of a Board of commissioners of Lunacy was in a great degree due to the facts which have been gathered by the State Board of Health during its few years of inspection and observation of our county insane asylums, and presented to the Legislature, we were not in favor of placing such duties upon the State Board of Health, but favored an independent organization. It was argued, however, by persons interested in the welfare of the indigent insane, and by the judiciary committee of the House, that the State Board of Health, with its present knowledge of the subject, was better prepared to perform the work which would devolve upon such a commission than a new board would be; and finally, rather than have the measure defeated, the Board accepted the proposed legislation, with the tacit understanding that if it were found impracticable for the latter to perform the duties and functions of a Board of Lunacy,

any recommendations to relieve them of these duties would be considered by the Legislature. An additional argument in favor of this arrangement was the fact that the work could be done at much less expense to the State in this way.

The new work has already been commenced, and we realize more than ever the great need there was for legislation of this kind. We have long appreciated the fact that while the inmates of our county insane asylums have, as a rule, plenty to eat, good beds, and comfortable rooms, there has been a total lack of remedial treatment on account of the failure of the various counties to provide attendants and the many other means necessary. In the work already done by the commission, this fact has become more obvious than ever before, since we have found at these institutions persons of good intellects and with no structural disease of the brain, and offering good promise of successful treatment, or at least of improvement in their condition. A full report of the work of this commission will be rendered to the Legislature.

THE REGISTRATION OF VITAL STATISTICS.

The registration of vital statistics, a work devolving upon the secretary of this Board, has already become of great importance to the State as a reference, to those interested in the many questions which can be answered only by a study of facts thus placed upon record. The ninth annual report of the registration of births, marriages, divorces, and deaths, is now in press. We can confidently say that no State in the Union has a more accurate and complete registration of deaths and marriages than New Hampshire. The birth records are very incomplete, as they are under any system in this country; in some towns and cities the record is very correct, while in others but little reliance is to be placed upon it. The accuracy of the record depends very largely upon the interest taken by the local registrars in the matter. This statement is not true regarding marriages and deaths; certificates are obtained for marriages, and burial permits are required in all cases of death; hence a registration of approximate accuracy is secured. Our death records are already of considerable value from a sanitary standpoint, and if this system of registration is continued, as it certainly ought to be, in a few

years we shall be in possession of data of great sanitary value. If a record of deaths had been maintained in this State during the last fifty years with the same accuracy that is now secured, we should possess very important facts regarding the prevalence of certain diseases in certain localities, which would, in all probability, present a complete solution of questions that cannot now be answered. The only way in which the public health interests of a state or nation can be correctly demonstrated and compared is through its registration of deaths; although a single volume of the report appears to the casual observer to be a mass of useless statistics, yet the record of deaths alone will be of more actual importance to the welfare of the people than most facts appertaining to the State to be found in the census reports. We would, therefore, urge upon all who are in any way connected with the record of vital statistics of the State, the importance of making every effort possible to secure accuracy and completeness.

SECRETARY'S REPORT.

TYPHOID FEVER AND DIPHTHERIA.

The following report upon typhoid fever and diphtheria is almost wholly compiled from reports and communications received from physicians. The report was made for the year 1888, as it was then supposed that the annual report of the board would be issued early in the following year, as heretofore. Hence, with one or two exceptions, it does not include any cases reported in 1889. The reports from physicians cover in a great measure the same ground that has been over in former reports, but they are presented once more for the purpose of giving additional testimony relative to these diseases, and to impress still further upon the public mind their connection with bad sanitary conditions.

The testimony of the physicians, which has been printed in the annual reports of the Board, has attracted considerable attention from those interested in studying the conditions connected with the prevalence of typhoid fever and diphtheria, and has done much toward enlightening the public in this direction. The State is greatly in debt to the medical profession for the interest it has taken in the prevention of disease and in securing for the people better hygienic conditions. The people in the several localities from which these reports have been received will read them with great interest.

Acworth — G. H. Powers, M. D.

Typhoid Fever. — None in my practice during the past year. Basing my opinion upon my experience as a practitioner, I believe that, with perfect sanitation of all surroundings and no abnormal changes in the alimentary canal, of secretions or ingesta,

we should be free from typhoid fever. I think it well established that any decayed food or bad water, taken in sufficient quantities and long enough continued, will produce typhoid or a similar filth disease. I also think that good food and good drink may be so changed in the alimentary canal of a body already weakened by constant excesses, as to produce at last the necessary organic change for typhoid fever.

Diphtheria. — One case of diphtheria in Concord, and two cases of diphtheritic sore throat in Acworth. In the case of diphtheria, a boy four years of age, decayed grapes had been eaten and retained in the alimentary canal until severe throat symptoms developed. The boy recovered, but the ocular muscles were paralyzed. It has been my experience that unsanitary surroundings furnish all the conditions necessary to develop this disease.

Acworth — CARL A. ALLEN, M. D.

Typhoid Fever. — Two cases, neither fatal; one in Unity and one in Alstead. The drinking-water was contaminated in one case; in the other, a grain thresher who traveled from house to house could discover no cause. It has been my experience that unsanitary conditions may be both direct and exciting cause.

Diphtheria. — Four cases, none fatal. All these cases were the result of contagion, the first case having been visited by a mother and child from another town who were just recovering from the disease, the subsequent cases following from contact with the first. All were mild cases, and by using preventive measures and isolation the disease went no further. If unsanitary conditions do not *cause* the disease, they certainly have a decided effect upon its severity and continuance.

Alstead — GEORGE H. GORHAM, M. D.

Typhoid Fever. — One case in adjoining town, recovered. The drinking-water was polluted. Think contaminated water the principal cause of the disease.

Diphtheria. — Three cases, recovered, imported. Consider poor drainage the exciting cause.

Amherst— J. B. PETTINGILL, M. D.

Typhoid Fever. — Three cases, two in town; one in Mont Vernon, fatal. In the two cases in town the drinking-water was polluted; in the other case was uncertain. It has been my experience that unsanitary conditions are almost always the cause of the disease.

Diphtheria. — None in my practice during the year. Basing my opinion upon my past experience, unsanitary conditions, except in cases of contagion, are the cause of all cases.

Amherst— H. D. HICKS, M. D.

Typhoid Fever. — One case. The patient was taken ill while away from home. He lived and slept in a store in which he was employed, and which during the day was filled with people (it was an auction store). The place was poorly ventilated, and the patient was without the ordinary comforts of life. He also took his meals irregularly, and was generally under unsanitary conditions. Undoubtedly the germ of typhoid fever is conveyed by defiled water courses.

I will mention one rather interesting case, which I have not reported as typhoid fever. Early last summer a man came to me with fever and looking so bad that I sent him home to bed, and followed him there to examine and care for him. On questioning the family about the water used at the house, I found they complained of the well, and I examined the premises as best I could.

The house was a large, old-fashioned one, consisting of the main house and an L. It was occupied by two families, the sink of one being at the back of the house and that of the other at the back of the L. Both families complained of the character of the water, saying it had a greasy feeling, and left a greasy surface on everything washed in it.

The well was under the L part of the house, entirely closed in, and not easily accessible. As far as known it had not been cleaned out for very many years. An old lady who formerly lived in the house, told me that the well had been condemned by its owner in her youth (at least forty years since). It was of the ordinary type, being closed up from bottom to top by

loose stone walling. The water was obtained from it by pumps and piping.

Each sink discharged its waste through a pipe in the side of the house, and by a wooden trough to a spot on the ground about twenty feet from each wall of house and L. The grass and weeds grew luxuriantly about the spot. This spot was not more than twenty or twenty-five feet from the well. These sinks, either one or both, had been in use for several generations, and had discharged their waste water at this place during that time.

On examination of the well water, I found it to be clear and sparkling in appearance, with some bubbles adhering to the sides of the bottle which held it. It was without any distinctive smell or taste. On adding to it some crystals of nitrate of silver, a cloud of white precipitate was developed, which increased on agitation. I made no other tests, on account of lack of facilities; but clearly the water was unfit for use.

The owner of the estate was exceedingly wroth that any stain should be cast on his well, and would not admit that a pool of sink drainings of more than forty years' duration could, by any possibility, find its way into a well twenty-five feet distant. The water was his favorite drink, he said, and must be pure on that account. I warned the tenants of the danger of using the water. As the case of illness terminated so soon, and there was considerable doubt as to its being typhoid, it was not reported except informally. Nothing was done about the well except, I believe, the owner cleaned it out, and reported the existence of elm tree roots in it. One tenant moved elsewhere, one still remains; but the house is on my mental black list as an undesirable place of residence and as a possible source of infection.

Diphtheria. — None observed during the year. Unsanitary conditions are undoubtedly a powerful factor in fostering the germs of diphtheria.

Antrim — I. G. ANTHOINE, M. D.

Typhoid Fever. — Three cases, none fatal. Could not trace the cause in any case. Have generally found unsanitary conditions in cases of typhoid fever.

Diphtheria. — Five cases, none fatal. Have not been able to

discover the cause in these cases. Believe unsanitary conditions to be the chief cause of diphtheria.

Antrim — MORRIS CHRISTIE, M. D.

Typhoid Fever. — One case. In my experience, unsanitary conditions have often been the cause of the disease.

Diphtheria. — Not a case during the year. Believe that unsanitary conditions and diphtheria bear the relation of cause and effect.

Barrington (*East*) — G. E. OSGOOD, M. D.

Typhoid Fever. — Two cases, neither fatal. In one case low, swampy land surrounded the dwelling; the other was contracted in Dover. We believe that unsanitary conditions are the cause of the disease.

Diphtheria. — Seven cases, none fatal. Could not demonstrate cause in any case. Two cases were in the vicinity of low, swampy land, and these were more severe than the others. Have observed that filth is a good culture ground for the disease. Care, good ventilation, and disinfectants modify cases.

Barrington — WILLIAM WATERHOUSE, M. D.

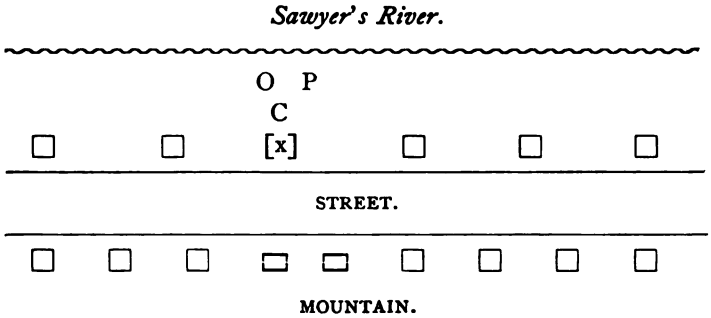
Typhoid Fever. — None observed during the year.

Diphtheria. — None in my practice.

Bartlett — EDWIN M. GROUND, M. D.

Typhoid Fever. — Fifteen cases, none fatal; ten cases in Bartlett, four in Livermore, and one in Jackson. Polluted drinking-water in every case but one. My opinion in regard to the relation of unsanitary conditions to typhoid fever is very emphatic. I believe that unsanitary conditions are necessary for the growth and development of the typhoid germ, and are consequently responsible for the spread of the disease. Fourteen of my cases could be traced to a contamination of the water supply. I will cite Livermore as a fair example of the source of all cases coming to my knowledge during the past season. In the first place, it must be remembered that Livermore is situated on the side of a mountain, and that the inclination toward Sawyer river is very abrupt. We begin at the river. Running parallel with

the river is situated a row of dwellings, numbering ten or twelve, then the street, and another row of dwellings. Each dwelling has a privy located at variable distances of a few feet in the rear. X marks the house where the disease first originated. O, in the rear, and just by the side of the river, marks the location of the spring (cesspool would be more appropriate) which furnished the water for all the dwellings marked; P, the privy, and C represents several feet of surface upon which the kitchen waste was thrown, and this amounted to a great quantity, as the building was used for a boarding-house. Across the street, directly opposite, are two stables, with manure heaps three feet high. When we take into consideration the abrupt inclination of the ground toward the spring, the relative location of the stables — the refuse from which has been accumulating for years — not more than 100 feet away, the privy, which had probably not been cleaned out since it was built, located not 20 feet from the source of water supply, and finally, the several feet square of surface, deluged



[] Dwellings. ▭ Stables. [x] House where first case appeared. O, Spring, the water supply of the village. P, Privy. C, where kitchen waste is thrown.

almost hourly with kitchen refuse and slops from a saw-mill boarding-house kitchen, passing its putridity by almost imperceptible gradations into the pool of water used by the occupants for cooking and drinking, can we conceive of anything more impure and filthy? Is it to be wondered at that typhoid fever, so clearly traceable to unsanitary surroundings, should develop? My other cases were just as clearly traced to unsanitary conditions as those originating at Livermore.

The cases in Bartlett all developed in persons who used the water from a well in close proximity to a manufacturing establishment. The water for the boiler was taken from this well, pumping it empty several times a day. The well is surrounded by privies used by the help, nearly fifty in number, and by decomposing bark and sawdust. I consider that pumping the well empty so often makes the current into the well more active and direct.

My case at Jackson was the second of a series of four. The first case that developed here I saw in consultation with the regular attendant. This lad was engaged in taking the kitchen waste away from a summer hotel. The second case (my case) developed in a family that took their water supply from a spring which received drainage from a hillside upon which was thrown the kitchen refuse from the summer hotel referred to. Two other cases occurred among the help in this hotel, one proving fatal.

I do not pretend to say, neither do I believe, that typhoid fever can originate from filth or unsanitary conditions alone, but I do say that these conditions are necessary for the growth and propagation of the typhoid bacillus. I do not believe in the sporadic or spontaneous origin of typhoid fever, or any other germ disease. Such a supposition is unphilosophical and unscientific. So called sporadic cases are so either from lack of inquiry or lack of information. It is no more possible for the germ of a particular disease to originate *de novo*, than it is for animal life of a higher order to originate spontaneously. We all know the story concerning the spontaneous production of mice, and the quicker the people fully appreciate the importance of putting and keeping their premises in a good sanitary condition, the sooner will we realize a diminution in the prevalence of typhoid fever and other preventable diseases. Typhoid fever is as preventable as smallpox, and should, in fact, be as largely prevented.

Bath — G. B. EMERSON, M. D.

Typhoid Fever. — Three cases, none fatal; one in Bath, one in Haverhill, and one in Benton.

Belmont — S. A. MERRILL, M. D.

Typhoid Fever. — None in my practice during the past year.

I believe that unsanitary conditions aggravate and multiply the specific germ of the disease, which I believe to be the cause of typhoid fever in all cases.

Diphtheria. — Have seen none during the year. Think unsanitary conditions bear a very direct relation to the disease. In my opinion, diphtheria is pre-eminently a "filth" disease.

Belmont — G. H. INGALLS, M. D.

Typhoid Fever. — Five cases, none fatal; four in town, one in Canterbury. Attribute the cause of the disease to impure drinking-water.

Diphtheria. — None observed during the year.

Berlin Falls — FRANK A. COLBY, M. D.

Typhoid Fever. — Forty-eight cases marked with typhoid symptoms, many of light character, three fatal; all in town. The drinking-water was polluted in all cases. Eleven cases in one house (tenement), with the well in the cellar, and nearly all drain pipes emptying into the same cellar, furnished decided proof of cause of the fever and propagation of the same. In my experience as a practitioner, nearly all cases have been directly traceable to unsanitary conditions.

Diphtheria. — Ten cases, one fatal. The disease has been of a mild type; few malignant cases in town, to my knowledge. My cases were due to bad surroundings, poor diet, filth, and indifference to contagion. In my practice, 90 per cent of cases are traceable to unsanitary conditions.

Boscawen — E. E. GRAVES, M. D.

Typhoid Fever. — Eight cases, none fatal; one in Boscawen, seven in Penacook. Seven cases used water from same well; but dozens of others used the same water and escaped. It has been my experience that unsanitary conditions are the predisposing, if not the exciting, cause.

Diphtheria. — Five cases, none fatal. Four cases were, in my opinion, due to bad sanitary conditions. In two cases the sink-drain was so situated that it must have polluted the water of the well which supplied the family — a leaky sink, situated directly over a well in the cellar.

Bradford — W. F. WALLACE, M. D.

Typhoid Fever. — Eight cases, one fatal; three in Bradford, four tn Newbury, one in Sutton. The drinking-water was polluted in all cases, with one exception, and in this latter case the cellar was full of rotting vegetables, and rotting wood at back door. It has been my experience that unsanitary conditions and typhoid fever are in the relation of cause to effect.

Diphtheria. — One case, recovered. In my opinion filth was the sole cause of the disease. Basing my opinion upon my experience, unsanitary conditions and diphtheria bear the relation of cause to effect.

Brentwood — MOSES W. CAVERLY, M. D.

Typhoid Fever. — Have not seen a well-marked case during the year.

Diphtheria. — Two cases, neither fatal. Could not refer the above cases to any particular cause, but, basing my opinion upon my past experience, I have no doubt that unsanitary conditions have much to do with the cause of the disease, even if in some cases it is difficult to discover them.

Brookline — C. H. HOLCOMBE, M. D.

Typhoid Fever. — Three cases, none fatal. Two cases originated in Townsend pupils from same school building; other case in town. Drinking-water was polluted in one case. It has been my experience that unsanitary conditions and typhoid fever bear the relation of cause to effect.

Diphtheria. — Ten cases, none fatal. Three of the above cases were in Townsend, Mass.; no cause discovered. A few years previous there had been an outbreak of diphtheria in the same locality.

In the cases in Brookline the cause was more apparent. In a large family there were several cases of suspicious sore throat, and after these had disappeared diphtheria broke out in a son's family across the way, the wife being first attacked and then the husband, the child escaping. The disease afterward appeared in four families situated in different parts of the town. In the first instance, the well was situated about mid-way between the

sinkspout and privy, and only a few feet from each. Often the water could not be used in the spring. The following analysis of the water, made by Prof. Angell, shows its character:

SANITARY ANALYSIS OF WATER.

C. H. HOLCOMBE, M. D.,
BROOKLINE, N. H.

Odorless.	
Color	*Yellowish tint*
Evaporation	Quiet
Residue	Uniform and grayish to *brownish*
Total solids, grains per gallon	25.7
Ignition of residue	It blackens intensely
Volatile and combustible matter	2.7
Hardness, degrees	5.5
Alkalinity	2.5
Chlorine, grains per gallon	*4.9*
Ammonia, parts per million:	
Free ammonia	*0.08*
Albuminoid ammonia	*0.19*
Nitric acid	*Much*
Nitrous acid	*Trace*
Lead	Trace
Iron	Trace
Sediment	Little
Microscopic Examination	Few infusoria and *bacteria*

This water is badly polluted and wholly unfit for drinking purposes.

The bad features are italicized.

EDMUND R. ANGELL.

DERRY, N. H., April 5, 1888.

In the second case the drinking-water was found to be good; in other cases the water was not analyzed.

Basing my opinion upon my experience as a practitioner, think unsanitary conditions act as a prominent factor in causing diphtheria.

Canaan — E. M. TUCKER, M. D.

Typhoid Fever. — One case, in Grafton. Running water from a spring was used, and the surroundings appeared to be good. While I believe in a specific germ that we shall sometime in the future know more about, still I believe unsanitary conditions may favor contagion.

Diphtheria. — None observed.

Canaan — ARA WHEAT, M. D.

Diphtheria. — None observed during the past year. Have no doubt but typhoid fever and diphtheria owe their origin to much the same causes — unsanitary conditions.

Candia — A. M. FOSTER, M. D.

Typhoid Fever. — Two cases, neither fatal. The first case was due to overwork; the second case was certainly caused by bad drinking-water, an old privy being within a few feet of the well, as was also a filthy pig-sty. There was also a foul cellar. In both cases there was quite severe chronic gastritis, in addition to the usual symptoms, and I attribute it to the same cause, namely, filthy surroundings. I consider unsanitary conditions to be a frequent cause of typhoid fever, and especially so when worry and overwork are added.

Diphtheria. — Three cases. One case, a child two years old, was complicated with membranous croup, and proved fatal. I think all the cases were due to, or at least rendered more severe by, improper drainage and lack of proper hygienic surroundings. I think unsanitary conditions constitute the most frequent cause of diphtheria.

This town has but very few wells of good water, and nearly all the drinking-water is badly contaminated by sewage or proximity to barnyards or other sources of filth, and all new comers here suffer from the effects of it. Most of the old residents seem to be acclimated to it, or else are perfectly case-hardened.

Charlestown — J. M. WHITAKER, M. D.

Typhoid Fever. — There has been no case of typhoid fever in town during the year, to my knowledge. My past experience leads me to believe that unsanitary condition are a factor, more or less potent, in nearly all cases of well-defined typhoid fever.

Diphtheria. — None observed. Think unsanitary conditions are to diphtheria as cause to effect.

Chester — ARTHUR L. EMERSON, M. D.

Typhoid Fever. — None.

Diphtheria. — None.

Chesterfield — JOHN F. BUTLER, M. D.

Typhoid Fever. — Four cases, one fatal. One case was contracted while nursing a typhoid patient in Vermont. Believe filth to be the primary cause.

Diphtheria. — None during the year. From past experience, think unsanitary conditions a prominent factor in spreading the disease.

Claremont — OSMON B. WAY, M. D.

Typhoid Fever. — Eight or ten cases, none fatal. Am not able to give cause.

Diphtheria. — Six cases, no deaths. Difficult to ascertain the cause.

Claremont — T. E. PARKER, M. D.

Typhoid Fever. — Two cases, neither fatal. Traced cause to drinking-water taken from an unclean cistern. I believe it is always traceable to some unsanitary condition.

Diphtheria. — One case. Decaying vegetable matter in the cellar. Believe true diphtheria may always be traced to unsanitary conditions.

Claremont — A. R. CUMMINGS, M. D.

Typhoid Fever. — None observed during the year.

Concord — D. E. SULLIVAN, M. D.

Typhoid Fever. — Seven cases, one fatal. I believe that typhoid produces typhoid, and nothing else can, though *the source* is oftentimes obscure.

Diphtheria. — Two cases, one fatal. Both cases were from contagion. Think unsanitary conditions have a very decided relation to diphtheria.

Concord — F. A. STILLINGS, M. D.

Typhoid Fever. — Seven cases, two fatal. Two more of the seven cases were taken to the hospital and died there. Five of the cases were in one family where, it is said, the drainage was found to be very defective, the drain, which was entered by two or three other soil pipes, being without any ventilation, and

higher at the point where it emerged from under the house than at the first water-closet. I was not present when the drain was uncovered, but simply quote the tenant. No cases occurred among the other families in the house. From my past experience consider that unsanitary conditions bear the closest relations to typhoid fever.

Diphtheria. — Two cases, neither fatal. Do not know how it was contracted. Believe diphtheria is caused by a specific poison (of which I do not know the nature), and unsanitary conditions, of course, lower the person's powers of resistance to the disease, and when he is exposed render his infection more certain.

Concord — C. P. BANCROFT, M. D. (Asylum.)

Typhoid Fever. — No cases during the year.
Diphtheria. — None during the year.

Concord — G. P. CONN, M. D.

Typhoid Fever. — Five cases, one fatal. Unsanitary conditions afford a *nidus* for the germs of the disease to develop where favorable conditions combine to allow development.

Diphtheria. — Four cases, none fatal. Bad sanitary conditions in all cases. Unsanitary conditions prolong the existence of the disease in a family or neighborhood.

Concord — CEORGE COOK, M. D.

Typhoid Fever. — Four cases, none fatal.
Diphtheria. — None observed.

Conway — S. A. EVANS, M. D.

Typhoid Fever. — No cases during the year. It is my opinion, based upon past experience, that the majority of cases arise from contaminated drinking-water.

Diphtheria. — None during the year. I believe the disease to be highly contagious and infectious, and that unsanitary conditions favor its spread.

Cornish Flat — G. W. HUNT, M. D.

Typhoid Fever. — None during the year. Judging from my past experience, I believe that unsanitary conditions increase the

fatality from the disease, as a pabulum is thus afforded for the reproduction of the specific germ. I do not think it a settled fact that unsanitary conditions produce typhoid fever *de novo*.

Diphtheria. — None observed during the year.

Deerfield — GEORGE H. TOWLE, M. D.

Typhoid Fever. — Not one case of well-marked typhoid during the year.

Diphtheria. — No cases have appeared during the year.

Derry Depot — IRA H. ADAMS, M. D.

Typhoid Fever. — Five cases, none fatal; two in town, three in Londonderry. Of the three cases in Londonderry, the first case came from Haverhill, Mass., and everything about the premises was conducive to the spread of the disease. Drinking-water was probably polluted in three cases. It is my opinion that nearly all cases are due to unsanitary conditions.

Diphtheria. — None during the year. Judging from my past experience, am of the opinion that 90 per cent of all cases are due to unsanitary conditions.

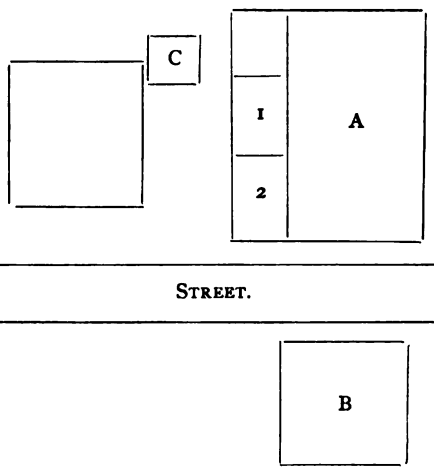
Dover — JAS. H. WHEELER, M. D.

Typhoid Fever. — Can recall but one unmistakable case; recovered. Could not trace this case to unsanitary conditions, but think they often have a very close relation to the disease.

Diphtheria. — Have seen many cases of diphtheritic disease, but have not had a very bad case during the past year. Cannot say that unsanitary conditions have had any direct causative influence in the above cases, but think they often have a very positive relation to the disease. My own idea is that the germs of diphtheria are in the atmosphere, more numerous when it is impure from the emanations of cesspools, etc., etc., and more dangerous when the diffusion of these emanations in a free atmosphere is prevented on account of their being precipitated by night air, and cool, damp days. Any change in the temperature of the blood, either from taking cold, over-fatigue, or from any inflamed or broken surface, renders the subject liable to the action of these germs; consequently we have every degree of intensity in the disease. As a rule, I do not believe the disease is contagious, except from the breath or direct transmission.

Dover — SMITH & CHAMBERLAIN, M. DS.

Typhoid Fever. — Seven cases, one fatal; six in Dover, one in Rollinsford. It is not probable that the drinking-water was contaminated. It is our opinion that unsanitary conditions furnish a proper soil for the propagation of the disease germs.



A, House where three cases were. 1 and 2, Location of chambers occupied by those contracting fever. B, House where one case of fever occurred. C, Privy which had not been cleaned out for two or three years, and which had a short ventilator coming up even with windows in rooms 1 and 2, the stench from which was so disagreeable as to force the closing of windows.

Diphtheria. — None observed during the year. From past experience, are of the opinion that unsanitary conditions and diphtheria are often in the relation of cause and effect.

Dover — JOHN R. HAM, M. D.

Typhoid Fever. — None observed during the year. From past experience, believe unsanitary conditions tend to multiply the germs of the disease, thereby increasing the number and severity of cases.

Diphtheria. — None during the year. It is my opinion that, as in typhoid fever, unsanitary conditions increase the development of the germs of the disease, thus multiplying the cases, and also tending to make the disease more severe.

Dover — LEVI G. HILL, M. D.

Typhoid Fever. — Few cases during the year 1888. Five in town, none fatal. Drinking-water polluted from sink-drain in one case; in other cases cause not so clear. Consider unsanitary conditions the most common cause of the disease.

Diphtheria. — Thirteen cases, two fatal. Most of them traceable to bad sanitary conditions. The two fatal cases had very bad surroundings; one died in an hour and the other in two hours after I was called. Think in one case, a young lady, diphtheria was caused by a filthy sink-pipe. Three cases occurred in a house with a filthy yard, a *quantity* of tainted meat, buried or slightly covered, close to the house, and a very offensive pig-pen adjoining. I do not believe the disease is *as* contagious as some suppose. Have seen many single cases in families, and if a second or third case occurs why may not all have the same origin?

Dover — M. C. LATHROP, M. D.

Typhoid Fever. — One mild case. Although convinced by other evidence that the specific cause of typhoid fever is intensified in its activity and virulence, and perhaps multiplied by ordinary unsanitary conditions, my observation alone would not warrant definite conclusions regarding their etiological influence in this disease.

Diphtheria. — Seven cases, one fatal. In several cases, especially the fatal case, the sanitary conditions were apparently good. In two cases there was very defective drainage of cellar, which received a part of the sink waste. Six, including the last named, made prompt recoveries. My experience tends to confirm the belief otherwise based, that unsanitary conditions frequently promote and aggravate the disease.

Dover — M. B. SULLIVAN, M. D.

Typhoid Fever. — Thirteen cases, none fatal; all in Dover. In all cases the drinking-water was polluted. Unsanitary conditions bear a most important relation to the disease.

Diphtheria. — Four cases, none fatal. Surely, unsanitary conditions were a factor in two cases; others in good surroundings. It is my opinion that unsanitary conditions increase the severity of the disease.

Dover — H. R. PARKER, M. D.

Typhoid Fever. — One case, fatal. This case was contracted in Nova Scotia; do not know its cause.

Diphtheria. — Five cases, two fatal. Am unable to state the cause in the cases. Unquestionably, unsanitary conditions have an influence in the causation of the disease.

Dover — CARL H. HORSCH, M. D.

Typhoid Fever. — None observed. As a result of my past experience, believe that deficient protection against changes of temperature, irregularity in diet and rest, drinking polluted water, living in over-crowded rooms and in houses poorly heated and ventilated, bad drainage, and, in fact, all unsanitary conditions, bear relations to typhoid fever.

Diphtheria. — None observed. Believe all unsanitary conditions are factors in causing diphtheria, but especially so are filthy sink-drains, polluted drinking-water, and neglected cesspools.

Effingham — J. M. LEAVITT, M. D.

Typhoid Fever. — None observed. From my past experience, am of the opinion that nearly every case can be traced to filth in food, water, or air, or the three combined.

Diphtheria. — None observed during the year.

Enfield — VALENTINE MANAHAN, M. D.

Typhoid Fever. — Only two cases, neither fatal; one in town, one in East Lebanon. Think fully one half the cases of typhoid fever can be traced to unsanitary conditions.

Enfield Centre — F. P. FISHER, M. D.

Typhoid Fever. — None during the year.

Diphtheria. — No cases of true diphtheria during the year; have had a number of cases of diphtheritic sore throat.

Epping — A. W. MITCHELL, M. D.

Typhoid Fever. — None during the year. From my past experience, consider the relation of unsanitary conditions to typhoid fever as a fertile spot to a grain of corn.

Diphtheria. — Two cases, recovered. Basing my opinion upon past experience, should say that some cases of the disease seem to be rendered more severe by the presence of unsanitary conditions, others not; but in this, as in any other disease tending to death by asthenia, all unsanitary surroundings are prejudicial.

Epping — A. C. BUSWELL, M. D.

Typhoid Fever. — Have seen none during the year. Think unsanitary conditions have everything to do with the causation of typhoid fever. I have noticed a large and growing number of cases that I cannot strictly call typhoid, but which have certain distinct typhoid symptoms. These I consider as a malarial type, and they readily yield to the usual quinine treatment. There is no marked malarial chill, but high temperature (100–2–or 3 F.), a brown furred tongue, but no tympanitis or abdominal tenderness. These cases seem clearly related to unsanitary conditions such as I should expect to find in typhoid cases, but they generally recover in a few days.

Diphtheria. — One case. The surroundings of the house where this case occurred were not of the best. The buildings were old, and the well from which the family water supply was obtained was not over forty feet from the barnyard, and on about the same level, while it was about the same distance, down grade, say one foot in ten, from the door where slops in abundance were thrown out daily, and just around the corner of the house from this door was an open sink-drain.

Epping — F. W. SPAULDING, M. D.

Typhoid Fever. — Two cases; one in town, one in Nottingham; neither fatal. Believe unsanitary conditions to be powerful factors in the promotion of typhoid fever.

Diphtheria. — Three cases, none fatal. In two cases the cellar of the house was damp; is almost always in that condition. Think unsanitary conditions are often direct promoters of the disease.

Exeter — WM. G. PERRY, M. D.

Typhoid Fever. — None observed.

Diphtheria. — None observed.

Franklin Falls — JOHN W. STAPLES, M. D.

Typhoid Fever. — Three very mild cases. Probably the drinking-water was polluted in every case, as the location was favorable for such a state of things. I believe typhoid fever is preventable under *perfect* sanitary conditions.

Diphtheria. — None during the year. Believe unsanitary conditions often bear to diphtheria the relation of cause, and always modify type of disease unfavorably.

Freedom — GEORGE W. LOUGEE, M. D.

Typhoid Fever. — Three cases, all recovered; two in town and one in Eaton. In my opinion the source of this disease is filth and impure water.

Diphtheria. — None seen during the year.

Gilsum — I. A. LOVELAND, M. D.

Typhoid Fever. — None during the year.

Diphtheria. — One case, under good sanitary conditions. Basing my opinion upon past experience, believe that sporadic cases are somewhat fostered by unsanitary conditions.

Goffstown — HENRY DODGE, M. D.

Typhoid Fever. — One case of true typhoid, several of typhoid type. Think typhoid fever is caused by a *specific* germ. Unsanitary conditions, in my opinion, favor the development of the germ.

Diphtheria. — One case. Unable to state cause in this case. My opinion is that diphtheria is always caused by bad sanitary conditions or by contagion.

Goffstown — FRANK BLAISDELL, M. D.

Typhoid Fever. — Saw no genuine case during the year. From my past experience, believe unsanitary conditions bear a causative relation to this disease. The longer I practice the more I am convinced that typhoid fever cannot occur without some sanitary defect as a cause.

Diphtheria. — Two cases; one imported from Concord; in the other the cause could not be traced. I can imagine only two ways in which this disease can originate: one by direct contact,

the other in some unhealthy condition in which the specific germ can originate.

Goshen — F. P. JONES, M. D.

Typhoid Fever. — None observed. My past experience has been that the first cases of typhoid fever in a neighborhood (unless imported) are in families whose surroundings are unsanitary.

Diphtheria. — None observed during the year. It has been my experience that the more unsanitary the surroundings the more severe the disease.

Greenfield — NATHANIEL F. CHEEVER, M. D.

Typhoid Fever. — One case, fatal; imported. From past experience, believe unsanitary conditions bear to typhoid fever the relation of cause to effect.

Diphtheria. — One case, not fatal. In this case there was a wet cellar, but am undecided as to the general relations of unsanitary conditions to the disease. Doubtless some cases are caused by such conditions.

Greenland — J. W. ODELL, M. D.

Typhoid Fever. — One case in North Hampton. From past experience should say that unsanitary conditions are present in a large proportion of cases from this disease.

Diphtheria. — One case; cause not known.

Greenland — WILLIAM O. JUNKINS, M. D.

Typhoid Fever. — Nine cases, two fatal; two in town, seven in adjacent towns. Drinking-water polluted in two cases. Believe unsanitary conditions are the *chief* factor in producing typhoid fever, judging from my experience as a practitioner.

Diphtheria. — Nine cases, two deaths. Am of the opinion that in six cases bad sanitary conditions were the chief factor. From my past experience, am of the opinion that unsanitary conditions are the chief factor in all cases, although I consider "catching cold" a frequent source of the disease.

Greenville — GEO. F. MUNSEY, M. D.

Typhoid Fever. — Twelve cases, three fatal; seven in town, three in New Ipswich, two in Wilton. It is probable that the

drinking-water was polluted in all but one case. I consider typhoid fever due to a germ, the *bacillus typhosus*, and in my opinion unsanitary conditions are very favorable to its development.

Diphtheria. — None observed during the year. From past experience, consider unsanitary conditions favorable to the development of the germ of this disease.

Hampton — WM. T. MERRILL, M. D.

Typhoid Fever. — Three cases, one fatal. Am confident that in two cases polluted drinking-water was the cause of the disease. In the third case am not so sure of the cause. Consider bad sanitary surroundings the important factor of the disease.

Diphtheria. — One case, recovered. Think bad drainage caused the disease in this case. In my opinion cold and impure air are the chief causes of the disease.

Hancock — EUGENE WASON, M. D.

Typhoid Fever. — None in this town or in the region covered by my ride, so far as I know. There were four cases at the Stoddard Lumber Company, which I will mention. January 10 I was called to the family of Mr. B., living near a saw-mill, and found three children sick with what appeared like incipient typhoid. I ordered their removal to another house, and they recovered at once. I found, upon examination, that the well was in the cellar, that the drain was obstructed, and there were several inches of water in the cellar, over well and all, and in addition the sink-drain had a leak and also discharged into the cellar.

I heard nothing more from this till March 31, when I was called to Mrs. C. in the other part of the same house. Cellar in about the same condition. Her sickness lasted a few days. As I have heard nothing from it since, presume when the spring opened the cellar became dry and was cleaned, as I wished to have it at the time.

I think unsanitary conditions are the entire cause of the *spread* of typhoid. I state this as the result of ten years' experience in the worst typhoid section of the State at the time, Londonderry and vicinity, where I had, before any improvements were made, from fifty to one hundred and fifty cases each year.

Diphtheria. — None during the past year. From past experience, am of the opinion that the disease *spreads* more from contagion; but am inclined to think the germ is more liable to flourish and make its first appearance when filth is present.

Hanover — C. P. FROST, M. D.

Typhoid Fever. — Three cases; students. Drinking-water was first-class in all cases. From my past experience, believe unsanitary conditions produce a condition of the system favorable for the development of the germ of typhoid fever when it has been received into the system.

Diphtheria. — None observed during the year. Believe unsanitary conditions favor the development of diphtheria.

Hanover — WILLIAM T. SMITH, M. D.

Typhoid Fever. — One case, recovered. The drinking-water in this case was contaminated by something, but could not discover what; it looked bad. Believe unsanitary conditions nourish the germ of the disease.

Haverhill — MOSES D. CARBEE, M. D.

Typhoid Fever. — None. Consider typhoid fever the direct outgrowth of unsanitary conditions.

Diphtheria. — Three cases, none fatal. Think they were directly traceable to bad drainage.

Haverhill — S. P. CARBEE, M. D.

Typhoid Fever. — Two cases, neither fatal. One case in town contracted the disease at The Weirs, and came home; the other case in Newbury, Vt. Am unable to state the cause in either case. It has been my experience that unsanitary conditions increase the severity of the disease, and render the patient less able to withstand it.

Diphtheria. — Six cases, two fatal. In my opinion the first five cases were caused by polluted water and unsanitary conditions about the house. One case caused by contagion. Unsanitary conditions are the most fruitful cause of the disease, so far as my observation extends.

Henniker — GEO. H. SANBORN, M. D.

Typhoid Fever. — None observed. Think every case of typhoid fever can be traced to unsanitary conditions.

Diphtheria. — None observed during the year. Think unsanitary conditions a source of the disease, which I do not believe to be contagious.

Henniker — LEONARD W. PEABODY, M. D.

Typhoid Fever. — Two cases of mild form; water was not polluted in either case. I have often expressed the opinion that sink-spouts, pig-pens and cesspools were potent sources of typhoid fever.

Diphtheria. — None observed during the year. Think unsanitary conditions bear to diphtheria the relation of cause to effect.

Henniker — N. W. BEAN, M. D.

Typhoid Fever. — None observed during the year.

Diphtheria. — No cases of *real* diphtheria during the year.

Hill — W. F. BALDWIN, M. D.

Typhoid Fever. — Four cases, one fatal. I sent a sample of the water used in a family where two cases occurred, to be examined, and it was found to be very impure and unfit for use. I am sure it was the only cause of the disease. In the other two cases could not trace the cause. The fatal case was in a house very near a slaughter-house, but the water came through an iron pipe a distance of nearly three quarters of a mile. The sink-drain discharged directly under the window of the room where the milk and food were kept. Think unsanitary conditions are responsible for all cases.

Diphtheria. — None observed.

Hillsborough. — JOHN GOODELL, M. D.

Typhoid Fever. — Three cases, all severe and all in one house; all recovered. These three cases were preceded by a case of "slow fever" of four weeks' duration, in the same family. Could not trace the cause of the disease to any reasonable source until near the termination of the cases, when I learned that a short time before the case of "slow fever" came down, the family had

obtained a cow that had prematurely dropped a calf, and the after-birth had been retained and slowly suppurated. The milk of this cow had been used, and was no doubt the cause of the disease.

Diphtheria. — Three cases, all mild. Have no doubt but two of these cases were caused by the filthy condition of the pig-sty which adjoined the house.

Hillsborough Bridge — MARCELLUS H. FELT, M. D.

Typhoid Fever. — Three cases, none fatal; two cases in one family. Think unsanitary conditions are the fruitful source of the disease, though am not always able to trace it directly to them.

Diphtheria. — Two cases, one fatal. One case doubtless caused in part by unsanitary conditions. Could not trace cause in other case. It has been my experience that unsanitary conditions and *contact* are the sole causes of the disease.

Hillsborough Bridge — A. C. BURNHAM, M. D.

Typhoid Fever. — Ten cases, four very severe, with two fatal. The first of the four severe cases was caused, I think, by overwork and taking cold; the other three by typhoid contagion from the first, as they were all in to see him during his sickness and death, contrary to my directions. The other cases were mild. Think the drinking-water was not polluted.

Diphtheria. — No well-developed case has been observed in my practice, although have had several cases of pharyngitis and tonsilitis, with suppuration. None fatal.

Hollis — L. R. QUA, M. D.

Typhoid Fever. — One case, imported from Nashua.

Diphtheria. — None observed.

Hooksett — T. M. TOGUS, M. D.

Typhoid Fever. — Twenty-one cases, four fatal; all in Hooksett. Think the drinking-water was polluted in six of the above cases. One of the fatal cases was a man who had been at work on the sawing machine at the Concord Railroad, and boarded himself. I attribute his illness to the filthiness of his apartment

in the car in which he slept. All the other cases occurred on the east side of the river and with one exception worked in the mill. Think most cases of the disease are attributable to the unsanitary conditions surrounding them.

Diphtheria. — None.

Hudson — D. O. SMITH, M. D.

Typhoid Fever. — Three cases, none fatal; two in town, one in Windham. Drinking-water was polluted in all cases. Consider unsanitary conditions a prolific source of the disease.

Diphtheria. — Two cases, neither fatal. Bad sanitary conditions in both cases, and believe they are a prolific cause of this disease. This town, as well as adjoining towns, has been comparatively free from all zymotic diseases the past year. It does seem that the masses of the people are giving more heed than formerly to the teachings of sanitary science. The children in our public schools are receiving faithful instruction from the teachers and board of education.

Jaffrey — F. G. HUMISTON, M. D.

Typhoid Fever. — One case, very mild type, in the adjacent town of Rindge. Probably caused by low state of health. My experience with the disease is as yet too limited to base an opinion upon.

Diphtheria. — None in my practice.

Jaffrey (East) — O. H. BRADLEY, M. D.

Typhoid Fever. — None observed during the year.

Diphtheria. — None.

Keene — GEORGE W. FLAGG, M. D.

Typhoid Fever. — One case, fatal. From my past experience believe that unsanitary conditions bear a very close relation to this disease.

Diphtheria. — Three cases. A large proportion of all cases are directly traceable to unsanitary conditions.

Keene — GEORGE B. TWITCHELL, M. D.

Typhoid Fever. — One case, recovered. In my opinion the

principal cause, in fact the sole cause, of this disease is directly or indirectly traceable to unsanitary conditions.

Diphtheria. — Two cases, neither fatal. Have always observed unsanitary conditions and diphtheria to go hand in hand.

Keene — IRA J. PROUTY, M. D.

Typhoid Fever. — Two cases, neither fatal. Both cases occurred where the sanitary conditions were good. From past experience am of the opinion that unsanitary surroundings debilitate the system, thus rendering it more liable to be affected by the germ of the disease.

Diphtheria. — None observed during the year 1888. Believe unsanitary conditions to be the principal cause of the disease.

Keene — W. R. DUNHAM, M. D.

Typhoid Fever. — None in my practice. From my past experience believe that unsanitary conditions favor the development of the disease.

Diphtheria. — None. Believe that unsanitary conditions favor its development.

Laconia — T. S. FOSTER, M. D.

Typhoid Fever. — Only two well-marked cases, both recovered. Could not trace either case to any well-defined cause. In my opinion, unsanitary conditions bear to typhoid fever the relation of cause to effect, although it is not always easy, or perhaps possible, to detect the true source of the disease. Though typhoid fever is more or less contagious, it undoubtedly has its origin in some unsanitary condition.

Diphtheria. — No well-marked cases; have had several cases of diphtheritic sore throat, but little or none of the constitutional symptoms characteristic of diphtheria. Believe unsanitary conditions bear a causative relation to diphtheria.

Lancaster — EZRA MITCHELL, M. D.

Typhoid Fever. — One case, at Groveton; none at Lancaster so far as I know. The drinking-water was polluted in the above case. Attribute the cause of this disease to unsanitary conditions.

Diphtheria. — None in my practice, and none in town to my

knowledge. From my past experience, believe unsanitary conditions expedite the cause of the disease.

Lebanon — T. H. CURRIE, M. D.

Typhoid Fever. — None worth reporting. In a practice of forty-eight years believe four out of every five cases were caused by polluted drinking-water. Unsanitary conditions and typhoid fever are twin sisters.

Diphtheria. — No case of true diphtheria; sore throats were quite common during the spring and first of summer, some quite severe, but no deposit of membrane. As a result of past observation, am of the opinion that with cleanliness of person and surroundings there would be general immunity from the disease.

Lebanon (West) — CHARLES B. DRAKE, M. D.

Typhoid Fever. — One case, recovered. The patient, a young lady, came from her work as sewing-machine agent in the city of Manchester to her home in West Lebanon, where she was taken sick with the disease. The fever developed within a week after her arrival at home. There were five brothers and sisters at home, and no symptoms of typhoid fever appeared among them, consequently I concluded that the patient contracted the disease at Manchester. From my past experience believe that unsanitary conditions bear a very close relation to typhoid fever.

Diphtheria. — Six cases, one severe, but recovered. Cesspools a factor in every case. Believe unsanitary conditions are favorable to the development of this disease.

Lisbon — O. H. BOYNTON, M. D.

Typhoid Fever. — Three cases in my practice, two fatal; only one case in Lisbon; in fact, they all originated in other towns. Had no means of determining the character of the surroundings. From past experience am of the opinion that unsanitary conditions are at least a predisposing cause of the disease.

Diphtheria. — None during the year. Years ago I had much experience with diphtheria; very little has occurred in this section of late. I believe it to be both contagious and infectious, and its germs are more readily and rapidly propagated where filth abounds. Improperly constructed sink-drains, cesspools, bad

plumbing and trapping about houses, in my judgment contribute largely to the violence and spread of this very fatal disease.

Lisbon — C. H. BOYNTON, M. D.

Typhoid Fever. — Have seen no well-marked cases during the year 1888. From past observation believe unsanitary conditions to be the most common cause of the disease.

Diphtheria. — None during the year. Consider this disease to be largely the result of unsanitary conditions.

Littleton — F. T. MOFFETT, M. D.

Typhoid Fever. — Five cases; three in Littleton, one in Dalton, one in Bethlehem. Drinking-water contaminated in two cases by sink-drain, in one by decomposing vegetable matter, and in two others by cesspools. My past observation has been to the effect that where we have good sanitary conditions there is little or no fever. In the case in Dalton, the spring from which the drinking-water was obtained was lower than the sink-drain, and about ten feet from it; on the other side, at a distance of about twenty feet, was a large cesspool.

Diphtheria. — One well-marked case. Am of the opinion that this case was caused by a lot of decomposing vegetable matter in the house. Believe that unsanitary conditions influence diphtheria as they do typhoid fever.

Littleton — T. E. SANGER, M. D.

Typhoid Fever. — Fifteen cases, one fatal; nine in town, six in Bethlehem and Franconia. Drinking-water polluted in about 50 per cent of these cases; in others, could not trace the cause. Believe unsanitary conditions are to typhoid fever as C to 100, although not always discernible, but believe they always exist.

Diphtheria. — None during the year. Am of the opinion that unsanitary conditions bear a close relation to the disease.

Londonderry — F. B. PERKINS, M. D.

Typhoid Fever. — None observed during the year.

Diphtheria. — None.

Manchester — CHARLES E. DODGE, M. D.

Typhoid Fever. — None observed during the year.

Diphtheria. — Three cases, one fatal. Could not discover

that unsanitary conditions influenced the disease, but consider them the cause frequently.

Manchester — H. B. BURNHAM, M. D.

Typhoid Fever. — None observed.
Diphtheria. — None.

Manchester — C. M. DODGE, M. D.

Typhoid Fever. — Two cases, both recovered. City water was used for all purposes. Have observed that when the system is run down and depraved, unsanitary conditions bear an intimate relation to the disease.

Diphtheria. — About twenty-five cases, two fatal. Am unable to state the cause. My opinion is very flexible in relation to the influence of unsanitary conditions. Have often seen this disease appear without warning in the very best conditioned homes. Undoubtedly (if it could be ascertained) there is some certain condition of the system united with some atmospheric contamination at the bottom of all this evil.

Manchester — H. C. CANNEY, M. D.

Typhoid Fever. — One case. There were cesspool, vaults, and sink-drains within ten feet of the well; sandy soil; but an analysis showed the water to be pure. It is my opinion that unsanitary conditions are the chief cause of the disease.

Diphtheria. — Twelve cases, one fatal. Had no reason to suppose that unsanitary conditions had any connection with these cases. Believe that unsanitary conditions bear the same relation to diphtheria that they do to any other grave sickness; do not consider their relation to diphtheria peculiar. There has been no epidemic of diphtheria in this city for the past twelve years; it has been endemic, and, like the poor, we have it always with us.

Manchester — C. B. STURTEVANT, M. D.

Typhoid Fever. — Have not seen a case during the past year. From my past experience believe unsanitary conditions favor the development of the disease.

Diphtheria. — Two cases, both recovered. In one case there was bad sewerage, and stagnant water near the house. Do no

consider that unsanitary conditions are to diphtheria as cause to effect, but think such conditions may help its development.

Manchester — GEORGE D. TOWNE, M. D.

Typhoid Fever. — Three cases, none fatal. Believe unsanitary conditions are present in 90 per cent of all cases of this disease.

Diphtheria. — Eleven cases, three fatal. Bad sanitary conditions were a factor of nearly every case, and from past experience believe they influence more than 95 per cent of all cases.

Marlborough — W. H. ALDRICH, M. D.

Typhoid Fever. — Seven cases, none fatal; two in Swanzey, five in Harrisville. The two cases in Swanzey were contracted away from home, the disease being caused by a hidden cesspool. The five cases in Harrisville occurred four in one family and one in an adjoining house. The family had been in the neighborhood but a short time. Upon investigation I found the well from which the drinking-water was obtained to be situated in the cellar, and the cellar was covered with six inches of surface water, and also leaching into this, on the back side of the house, was the foul sink-water, which the family had supposed was carried a safe distance from the house, but which had drained back through the subsoil into the cellar, the land back of the house being ascending. From my past experience believe the disease is nearly always contracted through some unsanitary condition.

Diphtheria. — None during the year; have had quite a number of cases of diphtheritic sore throat. I believe that genuine diphtheria is due to unsanitary conditions, together with debility of patient.

Marlow — MARSHALL PERKINS, M. D.

Typhoid Fever. — None observed.

Diphtheria. — None.

Merrimack — WARREN W. PILLSBURY, M. D.

Typhoid Fever. — Two cases, one in Merrimack and one in Bedford. The Bedford case was probably due to contact with clothing of another patient which was washed in the house where the above-named patient lived. The well-water, however, was

in a bad condition, and might produce typhoid. (Have at this date, January 11, 1889, another case in the same family, who became ill about one week after the first case, and am told that a young man sixteen years of age, who visited this family the last of November, died some four weeks since at Penacook of typhoid fever, after being confined to his bed eight days. It was during his visit that the infected clothing was washed in the house.) The case in this town was contracted in Nashua while attending a sister who was suffering from a severe attack of typhoid. Unsanitary conditions, in my opinion, are the cause in almost all cases of this disease.

Diphtheria. — Two cases, both recovered. The well where these cases occurred was about fifteen feet from the sink-spout. The spout, a lead pipe, did not protrude from the house more than an inch, and everything that would pass through the pipe was poured into the sink. Filth was everywhere about the house. The water was polluted to such an extent that a greasy scum was upon it. Cases have occurred in the same house in years gone by. Unsanitary conditions no doubt have much to do with diphtheria, but, in my opinion, not so much as is ascribed to them. If the individual is ripe for the disease, he will take it from contact with the germ wherever found.

Milford — H. S. HUTCHINSON, M. D.

Typhoid Fever. — One case, recovered. This patient came from a neighboring town while already ill with the disease. He had been in attendance upon two other cases, in the capacity of nurse, and doubtless contracted the fever in that way. Basing my opinion upon past experience, should say that unsanitary conditions bear a causative relation to the disease.

Diphtheria. — Six cases, none fatal. Nearly every case has been, in my opinion, unfavorably influenced by unsanitary conditions. At least two of my cases could be traced to contagion, one coming from a locality in Massachusetts where the disease was prevailing, and where one other member of the same family succumbed to the disease just before said case removed to New Hampshire, where it developed in severe form. The second case was communicated from a patient while convalescing, the patient falling ill shortly after. Diligent search failed to reveal any other

source of the disease; the conclusion, then, of contagion seems tenable. Believe unsanitary conditions bear a causative relation to this disease.

Milford — A. W. SMITH, M. D.

Typhoid Fever. — None observed during the year. I consider unsanitary conditions a very fruitful means of the spread of typhoid fever.

Milton — CHARLES D. JONES, M. D.

Typhoid Fever. — None.
Diphtheria. — None.

Milton Mills — M. K. COWELL, M. D.

Typhoid Fever. — Two cases, neither fatal; one in town, the other in Acton, Me. Drinking-water polluted in both cases. Consider unsanitary conditions largely the cause of the disease.

Diphtheria. — One case, recovered. Unsanitary conditions were the whole cause in this case, as I believe them to be in nearly every case.

Moultonborough — WILLIAM H. H. MASON, M. D.

Typhoid Fever. — None during the year. I believe typhoid fever to be caused by a direct poison from exposed decomposition, from polluted wells, sink-drains, cesspools, back door slops, and from the sick-room. I believe covered drains more dangerous than open ones, and either, at best, is dangerous. I believe with proper sanitary care the disease can be avoided.

Diphtheria. — None observed during the year. Think unsanitary conditions bear the same relation to diphtheria that they do to all other diseases.

Moultonborough — F. S. LOVERING, M. D.

Diphtheria. — None observed during the year. From past experience consider unsanitary conditions the direct and most common cause of the disease.

Mont Vernon — F. CHANDLER, M. D.

Typhoid Fever. — One case, recovered. Obscure etiology.
Diphtheria. — None observed.

Nashua — F. A. DEARBORN, M. D.

Typhoid Fever. — One case, recovered. Cause unknown; no possibility of the water's being contaminated.

Diphtheria. — None during the year 1888.

Nashua — CHARLES S. ROUNSEVEL, M. D.

Typhoid Fever. — Two cases, neither fatal. So far as I could learn, I think both cases were caused by contaminated drinking-water. As both cases were contracted out of town, had no opportunity of ascertaining from personal observation the real conditions, and could only judge from the statement of the patients, which, of course, is not to be wholly relied upon, that the bad sanitary conditions caused the outbreak. From past experience with the disease, consider bad sanitary conditions the chief cause in every instance.

Diphtheria. — Five cases, one fatal. In two cases I found defective sanitary conditions; in three cases the surroundings were apparently in good condition, and the subjects free from any constitutional taint. From past experience believe that unsanitary conditions favor the spread of the disease, as well as increase its severity, but think that other factors are necessary to its development.

Nashua — GEORGE A. UNDERHILL, M. D.

Typhoid Fever. — Six cases. Drinking-water polluted in all but one case. Basing my opinion upon my experience with the disease, believe that unsanitary conditions doubtless furnish a very fertile soil for the development of the typhoid fever germ, but do not believe that unsanitary conditions will cause the fever without the germ.

Diphtheria. — None observed during the year. Believe that the germ of diphtheria must be present, even with unsanitary conditions, in order to produce the disease.

New Boston — C. A. WEAVER, M. D.

Typhoid Fever. — Two cases, neither fatal. In one case the sanitary conditions were bad, and the drinking-water polluted; the other case came home from a visit, and the disease

immediately developed. In my opinion unsanitary conditions give development to the disease.

Diphtheria. — None observed during the year 1888. Have not been able to decide as to the cause of this disease, but my most severe cases have been where the sanitary conditions were very bad, and am inclined to think that they do favor the development of the disease, and yet I do get cases where the sanitary conditions appear to be of the best.

New Ipswich — FREDERICK W. JONES, M. D.

Typhoid Fever. — Have had no cases during the past season. Considering typhoid fever a filth disease, all unsanitary conditions will tend to develop the disease and cause an epidemic.

Diphtheria. — None observed. I consider that bad sanitary conditions aid in developing the germs that cause the disease.

New Ipswich — FREDERICK JONES, M. D.

Typhoid Fever. — None observed during the year. In the past I have thought that I could trace the cause to emanations from barn cellars, privies, contaminated water, etc.

Diphtheria. — Not a case. The disease seems to be caused by unsanitary conditions of a special character.

New London — JOHN F. MORRILL, M. D.

Typhoid Fever. — Five cases; three in town, one in Sutton; one in Wilmot (patient seventy-five years of age) proved fatal. Cases in town due to defective drainage, which, in my opinion, together with impure drinking-water, is the cause of the disease.

Diphtheria. — Seven cases, two fatal; all in Wilmot. I am positive that all my cases have been caused by defective drainage.

Newmarket — CHARLES A. MORSE, M. D.

Typhoid Fever. — None observed during 1888.

Diphtheria. — Have not seen a well-defined case during the year.

Newport — T. B. SANBORN, M. D.

Typhoid Fever. — Five cases, one fatal. In three cases the drinking-water was polluted. As a result of past experience,

attribute the cause of the disease to impure water, defective drainage, and vegetable decomposition.

Diphtheria. — Seven cases, none fatal. Believe bad hygienic conditions and polluted water are common causes of the disease. Have always observed filth to be a prime factor.

Newport — WILLIAM W. DARLING, M. D.

Typhoid Fever. — None observed in town during the year; one case out of town. The drinking-water was polluted by drainage from the barnyard, which was very near the well. Have observed that unsanitary conditions tend to increase the disease.

Diphtheria. — One case. Believe unsanitary conditions increase the severity of the disease. Quarantine every case I am called to treat.

Newport — A. H. KEMPTON, M. D.

Typhoid Fever. — Two cases, one fatal. Both cases were in the same family. A very foul privy-vault immediately connected with the living rooms, and that, too, on the west side of the house, from which direction the prevailing winds conveyed the foul gases into the atmosphere of the tenement. The only other member of this family suffered severely from diarrhœa. In every case of this disease coming under my observation, unsanitary conditions have probably been the sole cause.

Newton — J. F. AXTELL, M. D.

Typhoid Fever. — None in town during the year 1888.

Diphtheria. — None observed.

Northumberland (*Groveton*) — C. C. O'BRION, M. D.

Typhoid Fever.—Seven cases, one fatal; five in town, two in Stark. Am certain that the drinking-water was polluted in five of these cases. Have observed that unsanitary conditions are in a direct ratio to the number and severity of cases of typhoid fever.

Diphtheria. — None observed during the year.

Northwood — C. W. HANSON, M. D.

Diphtheria. — None observed.

Ossipee — M. A. HARMON, M. D.

Typhoid Fever. — None observed. My experience has been too limited as yet to judge of the cause of the disease.

Diphtheria — None observed. Believe unsanitary conditions greatly favor its development.

Ossipee Center — W. H. GRANT, M. D.

Typhoid Fever. — None observed during the year. From past experience believe unsanitary conditions are to typhoid fever as cause to effect.

Diphtheria. — None during the year. Consider unsanitary conditions the direct cause of this disease.

Pelham — W. SAWYER, M. D.

Typhoid Fever. — One case, not fatal. Sanitary condition of house and barn was very bad. In my opinion, typhoid fever as well as diphtheria has its direct source in decaying vegetable matter and the causes which produce such decay.

Diphtheria. — One case, recovered. In the past have found the disease more prevalent and of severer form among bad sanitary surroundings.

Peterborough — F. A. HODGDON, M. D.

Typhoid Fever. — Three cases, all recovered. In one case the sink-drain was very evidently the cause. It is my belief that unsanitary conditions cause the larger number of cases of this disease.

Peterborough — W. D. CHASE, M. D.

Typhoid Fever. — One case observed in town, recovered. Although in this single case could not attribute the cause to unsanitary conditions, am of the opinion that a large proportion of the cases are communicated through contaminated drinking-water.

Diphtheria — Two cases in one family, neither fatal. I believe that unsanitary conditions are only of secondary importance in this disease. The facts that it occurs quite as frequently during the cold months as in the hot ones, upon high ground as well as low, where the sanitary conditions are perfect as well as imper-

fect, all seem to indicate that it is not caused by filth alone. With an experience and observation extending over a period of nearly twenty-five years, I have come to the conclusion that filth has little, if anything, to do in the causation of diphtheria.

Peterborough — J. W. CUTLER, M. D.

Typhoid Fever. — One case. The drinking-water came from a pure spring, but the family was filthy. Unsanitary conditions have not much connection with the disease so far as I have observed thus far.

Diphtheria. — None genuine during the year 1888.

Pittsfield — F. J. AIKEN, M. D.

Typhoid Fever. — Three cases, none fatal. Two of the cases were in the village, and supplied with aqueduct water; the other was on a farm, but think the water was not contaminated. Given the germ, I believe that this disease is much more likely to develop where there are unsanitary surroundings.

Diphtheria. — One case, recovered, and several cases of diphtheritic sore throat. In the one case believe the drinking-water was polluted.

Plaistow — PITTS E. HOWES, M. D.

Typhoid Fever. — Three cases, one fatal, all in one family in South Kingston. In these cases the privy was within twenty-five feet of the well, with the land sloping toward the well, and, without doubt, pollution of the drinking-water was the primary cause of the disease. From my past experience believe filth to be the general cause of typhoid fever.

Diphtheria. — None observed during 1888. It is my opinion that as sanitary conditions are improved, diphtheria decreases.

Plymouth — TRISTRAM ROGERS, M. D.

Typhoid Fever. — Five cases, two fatal. One case was taken sick with the disease while in Tacoma, Wash., and was ill fifteen days before reaching Plymouth; died the third week.

Diphtheria. — None observed.

Plymouth — CYRUS K. KELLEY, M. D.

Typhoid Fever. — Have had none during the year 1888.

From past experience with the disease, have no doubt that filth is the cause.

Diphtheria. — None during the year. I think filth and general nastiness are exciting causes of the disease, as I have found such present in most of the cases I have treated.

Plymouth — HAVEN PALMER, M. D.

Typhoid Fever. — Three cases, none fatal; two in Plymouth, one in Holderness. It is not probable that the drinking-water was polluted in any case. Believe that unsanitary conditions help to develop the germ of the disease.

Diphtheria. — None observed.

Portsmouth — JOHN J. BERRY, M. D.

Typhoid Fever. — One case true typhoid, source of disease not determined. Being a specific disease, and propagated not only by the ingesta but also by a germ-laden atmosphere, it is, consequently, in a great degree a preventable disease, in my opinion.

Diphtheria. — Three typical cases, none fatal. One case occurred in surroundings which, from a sanitary standpoint, were generally bad. Unsanitary conditions, of course, favor the spread of the disease, and tend to increase its malignancy. I would here state that certain forms of tonsilitis, so called, are decidedly infectious, and should be similarly isolated.

Portsmouth — J. W. PARSONS, M. D.

Typhoid Fever. — Three cases, none fatal. One patient developed the fever a few days after having returned from the West, coming to a home with unsanitary surroundings. The other two cases were in a family which came to an adjoining town for a summer residence. They took an old house which had not been occupied for eight or ten years. The surroundings had been neglected, and the water from the well had not been used during these years, except to water cattle during a portion of the grazing season. The well was within a few feet of the site of an old barnyard, the ground falling off toward the well. The family consisted of father, mother, two young boys and three servants. The first of September typhoid fever developed in the mother

and the youngest son. The use of the well water was at once prohibited, and the family moved to this city as soon as possible. No other member of the family had any symptoms of the fever. The water was examined by Prof. Angell, and reported to be *totally unfit for use.* Past experience has led me to believe that unsanitary conditions have an important bearing upon the disease.

Diphtheria. — None observed during the year. Believe that unsanitary conditions may aggravate the disease, but am doubtful if they can be the cause.

Portsmouth — N. L. FOLSOM, M. D.

Typhoid Fever. — None observed. From past experience believe that unsanitary conditions frequently cause the disease, but not always.

Diphtheria. — None observed during the year 1888. Believe that unsanitary conditions may cause the disease in some instances.

Raymond — TRUE M. GOULD, M. D.

Typhoid Fever. — None observed. In some cases in the past have thought that unsanitary conditions had a great influence on the disease.

Diphtheria. — None observed during the year. Do not believe that unsanitary conditions influence the disease to any great extent.

Rochester — S. E. ROOT, M. D.

Typhoid Fever. — Two cases in town, both recovered. A French girl died of typhoid fever, contracted, as was supposed, while on an excursion to Canada. Dejections were thrown into the privy-vault without disinfection. The mother and sister were attacked as the direct result, in my opinion, of that carelessness. Both recovered. I saw them first after the sister had died. If I understand your question, — Basing your opinion upon your experience as a practitioner, what relation do unsanitary conditions bear to typhoid fever? — believe typhoid fever is the direct result of such conditions.

Diphtheria. — None observed during the year 1888. From

past experience believe unsanitary conditions and diphtheria bear the relation of cause and effect.

Rochester — E. T. HUBBARD, M. D.

Typhoid Fever. — None observed during the year. Basing my opinion upon past experience, believe that unsanitary conditions have all to do with producing the disease.

Diphtheria. — Five cases, none fatal. All of my cases have occurred in families surrounded by unsanitary conditions. Think improperly constructed vaults and cesspools and polluted water are the principal factors in producing the disease.

Rochester — ROBERT V. SWEET, M. D.

Typhoid Fever. — Seven cases, none fatal; six in town, one in an adjoining town.

Diphtheria. — One case, recovered. Caused by direct contact with a person infected.

Rochester — ALONZO S. WALLACE, M. D.

Typhoid Fever. — Two cases, both recovered. It is not probable that the drinking-water was contaminated in either case. From past experience believe unsanitary conditions are the parents of the disease.

Diphtheria. — Sixteen cases, three deaths. One case occurred in a house that had been unoccupied for six months. The vault was built of brick and covered with earth, making it nearly air-tight; the sink-pipe emptied into this vault, with no trap of any kind. The water discharging from the sink-pipe stirred up the foul contents of the vault, the effluvia coming back into the house through the pipe as the only means of escape. The odor in the kitchen was almost unbearable. In one week after the family moved in, an eight years old child was taken seriously ill with diphtheria. Other cases occurred in miserable, dirty houses, water standing in cellars most of the time. It is my opinion that unsanitary conditions have an important connection with the disease.

Rochester — STEPHEN YOUNG, M. D.

Typhoid Fever. — None observed.

Diphtheria. — Seven cases, three fatal. Think five cases were

caused by polluted water, the other two by contagion. Believe that the disease is contagious, and that unsanitary conditions render a person more liable to it.

Rollinsford — F. E. BRIGHAM, M. D.

Typhoid Fever. — None observed.
Diphtheria. — None.

Rye — WARREN PARSONS, M. D.

Typhoid Fever. — Two cases, neither fatal.
Diphtheria. — Two cases, neither fatal.

Salisbury — GEORGE P. TITCOMB, M. D.

Typhoid Fever. — None observed during the year. From past experience believe unsanitary conditions to be the cause of the disease.

Diphtheria. — None during the year. Believe unsanitary conditions cause depression of the vital forces.

Sandwich — E. W. HODSDON, M. D.

Typhoid Fever. — One case, fatal. Have observed unsanitary conditions to be a factor in nearly every case of this disease.

Diphtheria. — None observed during the year.

Sandwich — E. Q. MARSTON, M. D.

Typhoid Fever. — None observed.
Diphtheria. — None.

Seabrook — D. W. COLCORD, M. D.

Typhoid Fever. — Two cases, neither fatal. Drinking-water polluted in one case. I believe that in a majority of instances unsanitary conditions are the principal causes of the disease.

Diphtheria. — Three cases, one fatal. Bad sanitary conditions in most cases. I believe nearly all cases of diphtheria arise from unsanitary conditions, except those from direct contagion.

Seabrook — GEORGE R. FELLOWS, M. D.

Typhoid Fever. — Six cases, two in town ; four in one family mother and three children, in Salisbury, Mass., one fatal. I the four cases in Salisbury the disease was undoubtedly caused by

polluted drinking-water, which was taken from an open well within fifteen feet of the sink-spout. The house was shockingly filthy. Think we should look to the drinking-water for the cause of typhoid fever.

Diphtheria. — None observed.

Somersworth — LORENZO D. HAMBLET, M. D.

Typhoid Fever. — One case in Berwick, Me., fatal. In this case the sink-drain discharged into the cellar, and, in my opinion, caused the disease. Had the matter attended to, and no other case occurred in a family of nine children.

Diphtheria. — Several cases, none fatal. These cases were caused by bad drainage, etc., which I reported to the health officer, and he attended to the matter at once.

Somersworth — L. E. GRANT, M. D.

Typhoid Fever. — Five cases, one fatal; three in town, two in Berwick, Me. Drinking-water polluted in every case but one. Think there is something in unsanitary conditions which tends to typhoid fever.

Diphtheria. — None observed.

Somersworth — ALVIN JENKINS, M. D.

Typhoid Fever. — Only one case of well-marked typhoid, which case passed into the hands of another physician and terminated fatally. Three typical cases occurred at this same house some years ago, and I attributed the cause to bad sanitary conditions, particularly contaminated water. Think unsanitary conditions bear a very close relation to the disease.

Diphtheria. — Have not had a typical case during the year, although sore throats have been quite prevalent. From my experience with diphtheria should say that unsanitary conditions have much the same relation to the disease that the interception of the sun's rays and deep shade bear to unhealthful conditions of animal and vegetable life.

Somersworth (*Great Falls*) — LOUIS L. AUGER, M. D.

Typhoid Fever. — Seventeen cases, one fatal; all in town. Drinking-water polluted in three cases. Unsanitary conditions are nearly always present, according to my observation.

Diphtheria. — Three cases, none fatal. Bad sanitary conditions in one case.

South Newmarket — A. H. VARNEY, M. D.

Typhoid Fever. — Nine cases, one fatal: two cases in town, mild; two in Kensington, mild; five cases in Exeter, one fatal. The five cases in Exeter occurred in one family. The cause is known to have been polluted well-water, a sample of which was sent to the State Board of Health, and pronounced to be *horribly polluted*, as the following analysis by Prof. E. R. Angell shows:

Odor	Foul
Color	Yellowish
Evaporation	Quiet
Residue	Yellowish and flaky
Ignition of residue	It blackens strongly
Total solids, grains per gallon	31.2
Volatile and combustible matters	4.9
Hardness	degrees, 6.8
Alkalinity	" 2.0
Chlorine, grains per gallon	2.8
Ammonia, parts per million:	
free ammonia	1.460
albuminoid ammonia	0.218
Nitric acid	Much
Nitrous acid	Some
Sulphuric acid	Much
Carbonic acid	Much
Lead	Trace
Iron	Some
Sediment	Large quantity

Microscopic examination: Many infusoria and bacteria. Much disintegrated and suspicious looking matter. This water is horribly polluted.

On investigating the premises I found a stoned well eleven feet deep, with four feet of water, and a chain pump. The well was situated about twenty feet from two sink-drains, twenty-two feet from the privy, and eighteen feet from the hog-pen. Soil, sandy loam, about eight inches deep; sub-soil, yellow sand. I consider polluted drinking-water the most common source of typhoid fever.

Diphtheria. — None observed. From my past experience believe that foul gases, a cold, individual predisposition, and personal contagion the most common causes of the disease.

Strafford — N. C. TWOMBLY, M. D.

Typhoid Fever. — One case. Without doubt this case was caused by filth. There was a cesspool under the very door of the house, the stench from which penetrated the building every day. In the cellar I found decayed meat and vegetables of all kinds. The stench was fearful, and I firmly believe that this unsanitary condition was the cause of the fever. It was a very severe form of typhoid, but the patient recovered. From my experience I believe that with good sanitary conditions, typhoid fever would greatly diminish.

Diphtheria. — None during the year 1888. I believe that cesspools, polluted water, sink-drains, and all filth, are prominent factors in producing the germ of diphtheria. I notice on some farms, particularly around the house, old rotten wood, old shoes, and all manner of rubbish that has been collecting for years, breeding bugs, and making the place generally filthy. This condition, in my opinion, not only produces disease in the human family, but disease in corn, wheat, potatoes, and, in fact, about every kind of produce raised on the farm. These very men will complain when their crops are not good, when they are themselves to blame. They are also responsible for many diseases under which they suffer.

Sunapee — E. C. FISHER, M. D.

Typhoid Fever. — Three cases, none fatal; two in town, one in New London. Was not able to determine the cause, although I think the water was contaminated. Have observed that typhoid fever is more liable to occur under unsanitary conditions, but have often found cases where the sanitary conditions *seemed* good.

Diphtheria. — None observed. Think unsanitary conditions cause many cases of diphtheria.

Suncook — J. R. KIMBALL, M. D.

Typhoid Fever. — Have had only two or three mild cases. Made no examination of the drinking-water. Without doubt filth of every kind is a factor in typhoid fever; but I think the *real cause* of the disease is yet to be found, and may be within the system.

Diphtheria. — None.

Suncook — GEORGE H. LARABEE, M. D.

Typhoid Fever. — None observed during the year. I do not believe in unsanitary conditions; still there is quite a chance for argument as to their relation to typhoid fever.

Diphtheria. — None observed, although have had several cases of severe tonsilitis. Have no doubt that unsanitary conditions tend to spread the disease.

Surry — W. H. PORTER. M. D.

Typhoid Fever. — None observed during the year. If perfect sanitary conditions could be secured for all, it is my opinion that typhoid fever and also its twin scourge, diphtheria, would become nearly extinct.

Diphtheria. — None. Believe that unsanitary conditions are the most potent cause of diphtheria.

Tilton — C. R. GOULD, M. D.

Typhoid Fever. — Eight cases, none fatal; one in Franklin, three in Northfield, and four in town. Drinking-water was probably polluted in all cases. Believe that unsanitary conditions and typhoid fever stand in the relation of cause and effect.

Diphtheria. — One case, recovered. Regarding the relation of unsanitary conditions to the disease, would say that "unsanitary" is a very broad term. Do not think filth alone will cause diphtheria.

Troy — M. T. STONE, M. D.

Typhoid Fever. — None observed.

Diphtheria. — None.

Tuftonborough — T. AVANS HALEY, M. D.

Typhoid Fever. — None observed during the year 1888. From past experience with the disease am of the opinion that in most cases unsanitary conditions cause the disease.

Diphtheria. — None, although have had several cases of follicular tonsilitis. During the more than twenty years of my practice in town, have had very few cases of true diphtheria. Believe that unsanitary conditions bear a very close relation to the disease.

Wakefield — JOHN E. SCRUTON, M. D.

Typhoid Fever. — Eight cases, one fatal: four cases in town, one having contracted the disease in Conway; one case in Middleton, contracted in Bartlett; two cases in Milton, one of them contracted in Farmington.

Diphtheria. — None observed.

Wakefield — SAMUEL W. ROBERTS, M. D.

Typhoid Fever. — One case in Farmington, not fatal. I am in a region not subject to this disease, and have never had a case where it might be expected to appear if unsanitary conditions would produce it. Along my route there are many buildings so located that the well and cellar would appear to be the natural cesspools of the privy, sink, pig-pen and barnyard drainage, and yet the disease has never appeared in these families. While for thirty-five years as a practitioner I have thought I could trace it to contagion, being brought from distant localities, and in memory can go back more than fifty years, I have not observed a single case that I could trace to unsanitary conditions. Do not believe that unsanitary conditions have any relation to typhoid fever.

Walpole — GEORGE A. BLAKE, M. D.

Typhoid Fever. — None observed.

Diphtheria. — None.

Warner — J. R. COGGSWELL, M. D.

Typhoid Fever. — No cases of true typhoid. Some mongrel cases, as they might be called; some with a malarial element. If all that is said about bad air and water were true, fevers and other diseases would be much more prevalent than now. There must be some means by which the system largely eliminates or destroys these germs of disease, or the land would be depopulated. It is the exception now to find a pure water supply in the country; neither do they have proper ventilation or good drainage of their premises. Moreover, there is consumed a great amount of diseased meat, unripe or over-ripe fruit and vegetables, and adulterated food supplies, besides quantities of milk from tuberculous cows.

Diphtheria. — None in my practice during the year. I cannot say that unsanitary conditions produce the disease, but when contracted they increase the danger and help spread it. I believe the practice of allowing saw-mills, bobbin mills, peg factories, etc., to disgorge the shavings, sawdust, chips, and other refuse into the streams upon which they are located, to be very pernicious, and the cause of much sickness in certain localities near the low lands, where much of this refuse is deposited and left to decay. I also think some plan for the inspection of meat, either before or after the animal is slaughtered, would be a very wise measure. Without doubt our people now consume a large quantity of diseased meat, and there seems to be no help for it as our laws now are.

Washington (East) — GEORGE N. GAGE, M. D.

Typhoid Fever. — One case, fatal from an attack of apoplexy which occurred during convalescence. I have no doubt that unsanitary conditions favor the development of the disease. Physical exhaustion from any cause renders one much more susceptible to the disease. From my own experience I am led to believe that typhoid fever is due fully as much to the condition of the person attacked as to his sanitary surroundings. Cases occur where there appear to be no unsanitary conditions, and that very frequently, too. Again, with very unsanitary conditions the disease does not appear for years. Why is one member of a family attacked, and the others not, though all breathe the same air, drink the same water, and eat at the same table? Unsanitary surroundings are a cause, but not the only one, I think.

Diphtheria. — No cases seen during the year 1888.

Westmoreland — J. A. CRAIG, M. D.

Typhoid Fever. — One case, recovered. This case was undoubtedly caused by pollution from a sink-drain which passed in close proximity to the well. The ground around the well was saturated with the drainage and the water contaminated.

Diphtheria. — One case, malignant, fatal. Bad sanitary conditions were undoubtedly the main factor in this case. The case occurred at a farmhouse, a girl aged fifteen years. She was

feebly constituted, and was an easy victim to disease. There was a wooden sink in the kitchen, and from it a wooden spout discharged the waste directly under the window; it had been in position for several years. The ground within a radius of ten feet was completely saturated with the drainage. From repeated usage the earth has been washed so as to form a cesspool, and I was informed that it had remained in that condition for three years. The case was unusually profound, terminating fatally in seventy-two hours.

Wilton — J. FLEEMAN, M. D.

Typhoid Fever. — Five cases, none fatal; four in town, one in an adjacent town. It is not probable that the drinking-water was polluted in any case. I did not find that unsanitary conditions had any connection with these cases, and I have no more cases of the disease than I did fifty years ago, when I first commenced practice. Nearly every case I have had in all my practice has occurred among the better classes of the people, and those who take the most care to keep their surroundings neat and clean. Had typhoid fever occurred in destitute families and among the foreign people, I should have a very different opinion, for they are generally filthy, and usually live in the poorest quarters of a town, where houses are huddled close together, drainage poor, and the rudest of outhouses, with wells in close proximity frequently. This may not prove true in cities, but my experience leads me to believe that it comes where it will.

Diphtheria. — One case. Unsanitary conditions had no part in causing this case. In some cases, if the condition of the patient had become very weak before the disease developed, unsanitary conditions would affect it, but generally the disease has been carried by others, more like contagion.

Winchester — GEORGE W. PEIRCE, M. D.

Typhoid Fever. — None observed during the year. Believe unsanitary conditions to be the predisposing but not the specific cause of the disease.

Diphtheria. — Five cases, none fatal. No unsanitary conditions. Believe unsanitary conditions to be predisposing causes of diphtheria.

Walpole — N. H. SCOTT, M. D.

Typhoid Fever. — Three cases, none fatal; two in town, one in Tuftonborough. Know of no cause in any case.

Diphtheria. — Three cases, none fatal. In all these cases there were unsanitary surroundings.

Woodsville — C. R. GIBSON, M. D.

Typhoid Fever. — Five cases, two fatal; four in town, one in Bath. In all these cases the drainage was bad, and in one fatal case a neighbor's vault was within twelve feet of the patient's sleeping-room. I think unsanitary conditions are the exciting cause, while any condition that depresses the system, as overwork, insufficient or poorly prepared food, worry, etc., may be called the predisposing causes.

Diphtheria. — One case, not fatal.

TYPHOID FEVER.

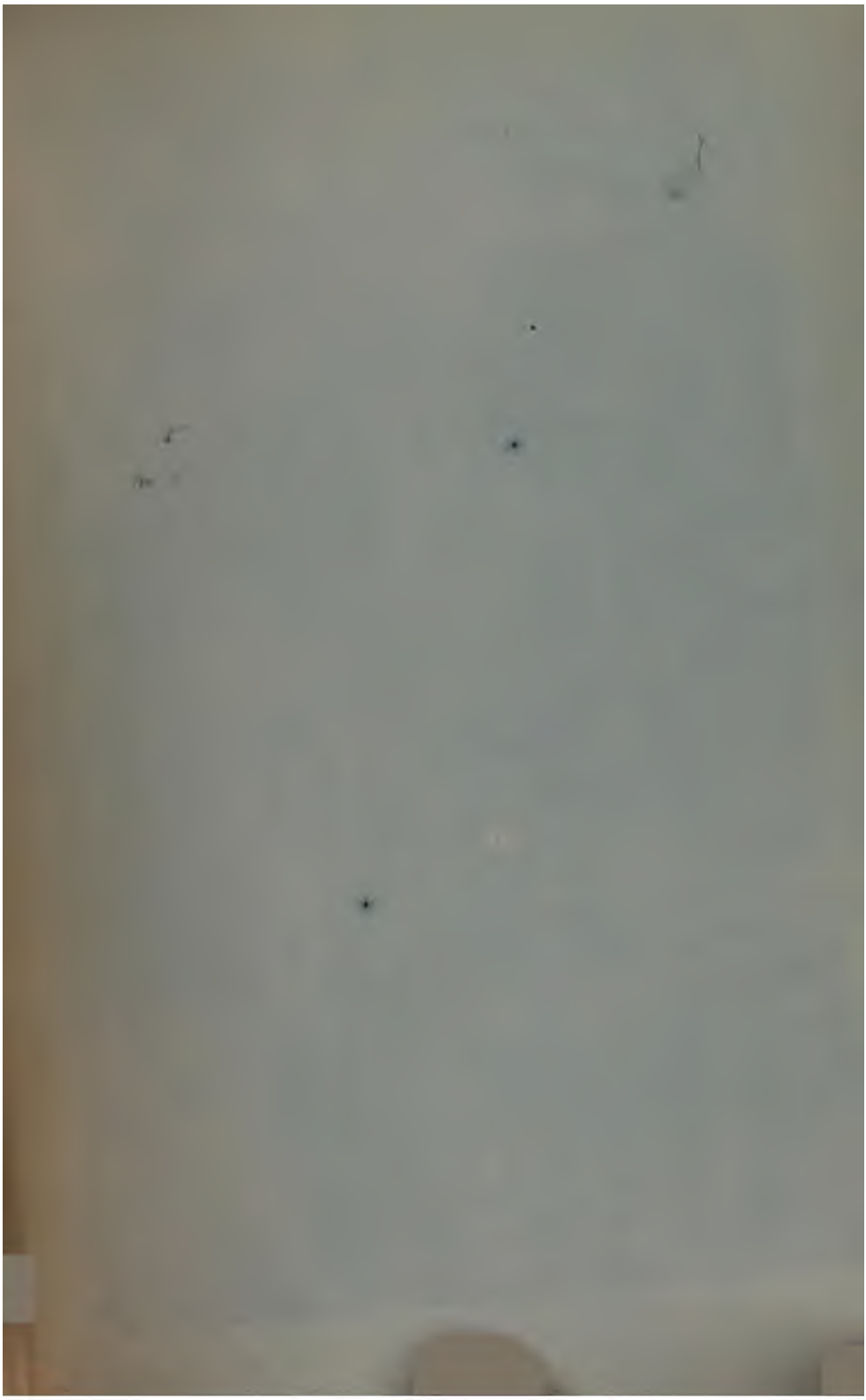
Of the physicians reporting cases of typhoid fever in their practice during the year 1888, forty-two traced the source of one or more cases to drinking-water polluted by cesspools, sink-drains, privy-vaults, etc.,; seven reported cases under unsanitary conditions generally; two found drainage conducted into cellars; two, decaying vegetables in cellars; two, bad drainage; three reported cases in filthy families; five had cases which resulted from contagion; thirteen had imported cases, consequently there was no opportunity to study the cause; overwork in two cases. One or more cases were reported as occurring under the following conditions, by one physician each: Impure milk, exhausted vitality, cesspool close to door of dwelling, privy-vault close to sleeping-room window, sink-drain. Twenty-two reported as having failed in their efforts to discover the cause of the disease in their cases, while eighteen made no mention of having attempted to do so. One hundred and nine physicians reported four hundred and seventy-four cases under the above attributed causes. One hundred physicians express the opinion, as the result of their experience with the disease, that unsanitary conditions are always present in cases of typhoid fever, either as the direct cause of the disease, or as a means of developing the germ or specific

poison which causes the disease. To the question, Basing your opinion upon your experience as a practitioner, what relation do unsanitary conditions bear to typhoid fever? eleven physicians returned the answer, "cause and effect." Seven express the opinion that the disease may always be traced to polluted water; four firmly believe that unsanitary conditions have no connection whatever with the disease; six have as yet had a too limited experience to have arrived at any conclusion, while thirty-eight make no reply to the question as to what they believe may be the relations of unsanitary conditions and typhoid fever.

DIPHTHERIA.

Sixty-eight physicians reported two hundred and eighty-two cases of diphtheria in their practice during the year 1888. Of these, ninety-two cases were attributed to unsanitary surroundings, sixteen to polluted drinking-water, twelve to contagion, thirteen to defective drainage, six to emanations from cesspools, four to filth, three to damp cellars, two each to swampy land about buildings, decaying vegetable matter in cellar, sink-drain discharging into cellar, and filthy pig-sty, and one each to eating decayed grapes, defective sink-drain, and improperly constructed vault. Four of the reported cases were imported, consequently no investigation of the surroundings could be made. Fifteen physicians reported that in seventy-four cases they could discover no cause, while in the remaining cases no mention of cause is made.

In reporting upon the disease in general, seventy-five physicians express the opinion that unsanitary conditions have a decided influence upon the disease, either as the direct cause or as the means of developing the specific germ or poison; nine believe the relation of unsanitary conditions and diphtheria to be that of cause and effect; three assign filth as the cause; four attribute it to a specific germ or poison; four believe that unsanitary conditions have little or no connection with the disease, while two are undecided in the matter, and two attribute the cause to cold and impure air.



Rockingham Co Almshouse &

COUNTY ALMSHOUSES AND OTHER INSTITUTIONS.

ROCKINGHAM COUNTY ALMSHOUSE.

This institution is located in Brentwood, about two miles from the railway station at Epping. The main building, A, is a large wooden structure, five stories in height, including basement. The insane asylum, B, is situated near by and is a much more modern structure than the almshouse.

At the time of inspection the institution contained one hundred and sixty-three inmates, seventy-four of whom were classed as insane, forty-five of the latter being confined in the insane asylum.

The last report upon this institution contained many criticisms on the sanitary condition of the buildings, and the following recommendations were made to the county commissioners:

"1. Improvements in the bathroom used by the superintendent and family, by putting in a new water-closet, a set washbowl, and properly trapping these and the bathtub. The soil-pipe should be extended upward through the roof, and surface ventilation provided for by a pipe extending to a constantly heated chimney.

"2. The men's privy, adjacent to the jail, should be abandoned *at once*, the vault to be thoroughly cleansed and disinfected, and the brick wall, which forms a part of the corridor wall of the jail, should be thoroughly cleansed with a hot solution of potash, followed by a strong solution of corrosive sublimate.

"3. The sewer openings in the floor of the jail should be closed after the sewer leading therefrom has been properly cleansed and disinfected. These openings are wholly unnecessary, as the surplus water should be carefully removed with mops or cloths so as not to leave a large quantity to be disposed of by evaporation, thus keeping the jail in a state of constant moisture.

"4. Set washbowls should be provided in the jail corridors for the use of the prisoners. A water-closet should also be constructed in the jail.

"5. The privy used by the female inmates should be abandoned and a water-carriage system substituted. The vaults should be thoroughly cleansed and disinfected and filled with fresh earth.

"6. Water-closets should be substituted for the privies now in

use at the institution, with the possible exception of the wooden building in the rear of the insane asylum.

"7. The sinks, slop-hoppers, etc., in the basement of the main building should all be renovated, and in some instances new structures substituted. Traps should be placed upon all pipes entering the sewer or soil-pipe. It is recommended that all pipes leading to the sewer in the basement of the building run above the brick or cement floor, and not be buried in or below it, as is now the case with many of the pipes.

"8. In the insane asylum proper, water-carriage for the sewage is recommended. The vault in the new wing, constructed for a latrine, should be supplanted by water-closets or a latrine built upon sanitary principles, as in its present construction it will always be disgustingly filthy.

"9. All the cesspools now existing should be cleaned out and filled with earth. There is no occasion for cesspools in any part of the sewer system, except, possibly, at its terminus.

"10. One continuous sewer should take all the sewage from the institution to some point sufficiently distant from the buildings to be unobjectionable. There it may be collected in settling-tanks for agricultural purposes, or otherwise disposed of as the county commissioners may determine.

"11. The system of plumbing should be carefully examined and its many faults corrected. The absence of traps, the conducting of the overflow pipes from the water tank in the insane asylum to the privy-vault, and many other defects of a similar character should be corrected.

"These recommendations are general in character and include only those changes which ought to be carried out immediately. Improvements in the system of ventilation will be necessary after the work outlined above has been performed. In carrying out these recommendations, exact specifications in respect to sewering and plumbing should be made, whether done by contract or otherwise. Only first-class fixtures should be purchased, and nothing but first-class work accepted, as such is invariably the cheapest in the end. The work should be placed under the supervision of some person thoroughly competent to determine whether or not it is being properly executed."

In regard to the above recommendations, we are pleased to be

able to report that nearly all of them have been carried out by the county commissioners. The plumbing in the superintendent's part of the building has been improved in accordance with the first suggestion. The men's privy adjacent to the jail, which for years had been a nuisance, has been entirely removed and the vault filled with fresh earth, and the walls of the jail adjacent to the vault disinfected and whitewashed. A sink for washing purposes and a slop-hopper and closet have been constructed in the jail.

The privy used by the female inmates has been abandoned and the building removed, the vaults cleansed and filled with earth, thereby ridding the institution of a bad nuisance. Latrines have been substituted throughout the entire building for the privies which formerly existed. These were found to be in good condition, with the exception of one which did not contain a sufficient amount of water — an oversight of the attendant.

The sinks, slop-hoppers, etc., in the basement of the main building, have been renovated, the plumbing overhauled, fixtures trapped, and the old box-drain removed and Akron-pipe sewer substituted.

The eighth recommendation has also been carried out. The privies in the insane asylum have been abandoned and latrines put in. The cesspools and privy-vaults which formerly existed have been abandoned, cleansed, and filled with fresh earth, so that there are now no cesspools about the buildings.

One continuous sewer has been built in accordance with the tenth suggestion. Two settling-tanks have been constructed at the mouth of the sewer, while the overflow empties into an adjacent brook. The substance collected in the settling-tanks is used by the superintendent for agricultural purposes.

The plumbing has been entirely reconstructed and the many faults which existed in the old system corrected. The work done in this direction was of considerable magnitude, and has placed the institution upon a much better sanitary basis than heretofore.

In addition to the above a pump has been put in for fire purposes. A stand-pipe runs from basement to attic, with a coupling on each floor for the attachment of hose. The institution has been provided with about five hundred feet of good hose. We would suggest that another stand-pipe be placed in the west end

of the building, as one is liable to be rendered useless by the location of a fire.

A two-story veranda has been built upon the west end of the main building, making a very comfortable and pleasant addition for the female inmates.

The women's hospital consists of three rooms connected by an archway. There are five beds in this hospital. The men's hospital is arranged in a similar manner, and contains eight beds. Neither of the hospitals is large enough for the demands of the institution, the men's in particular being badly crowded.

The general condition of the buildings is good, although there is room for improvement. The ventilation is not as good as it ought to be, neither in the main house nor in the asylum. The almshouse proper is a badly constructed building, not well calculated for this purpose. It is considerably decayed in many places, and the time is not far distant when a new building will be demanded, or extensive repairs to the present one. The absurdity of constructing an almshouse practically five stories in height is apparent to any one who visits this institution. The plastering has been repaired in many places, and presents a patched and unsightly appearance. A considerable portion of the building needs painting and whitewashing.

The institution is under the management of Mr. and Mrs. Charles C. Tucker. There is an assistant superintendent, a turnkey, and a male and female attendant in charge of the insane.

The jail was found to be in a most excellent condition, thoroughly whitewashed, neat and clean. It contains thirty-six cells. It is not large enough for the demands of the county. At one time sixty-nine prisoners were confined in it, while for a short time during the past winter there were fifty prisoners.

STRAFFORD COUNTY ALMSHOUSE.

At the time this institution was inspected there were present one hundred and eighty inmates, forty-six of whom were inmates of the insane asylum. The almshouse, situated at Dover, consists of a large, two-story building, A, with two large wings, extending back from the main house and not shown in the photograph. The building was constructed very much after the pattern

A
B
Strafford Co. Almshouse & Insane Asylum

of the Merrimack county almshouse, and was built only a few years ago, the former buildings having been destroyed by fire with a loss of thirteen lives.

The superintendent occupies the middle portion of the main building, which separates the wards occupied by the male and the female inmates.

The entire building is heated by steam and is fairly well ventilated. During the past year the house has been refurnished to quite an extent, floors painted, walls dressed over, new curtains, etc. The rooms are provided with iron bedsteads, and the beds were clean and tidy. The rooms were also clean and were well whitewashed and painted. All the rooms in the institution are washed twice a week regularly, and oftener if necessary. The beds are made up with fresh clothing every Saturday, and changed during the week if needed. The bathrooms and closets were found in good condition.

A thing much needed at this institution is a separate building or ward for the children. There were forty-five of them at the institution, and in the winter there are between fifty and sixty. Many of them are as bright, wholesome, and intelligent as can be found anywhere, but they are constantly associated, day and night, with the older inmates, and in this way rapidly contract the bad and vulgar language which is used in their presence. The parents of thirteen of the children are inmates of the institution. The schoolroom is in the main building. It is suggested by the superintendent that the Snell house, so called, located a short distance from the almshouse, might be made suitable for the purpose at very small expense. It is now used for storage purposes only.

The exterior appearance is well shown in the illustration, A being the almshouse, and B the asylum for the insane. The asylum contains forty-six rooms or cells, and at the time of inspection all were occupied. This is a wooden building, very cheaply and poorly constructed, and is not suitable for an insane asylum. The floors and walls are in a bad condition. The floors leak if water is put upon them, and unless great care is taken the rooms and beds below are wet by the water dripping through. The roof also leaks into two or three rooms. The floors and walls have not been kept well painted,

consequently the woodwork has become foul by absorption, and the institution has a constant disagreeable odor. There is no classification of the patients.

The building is heated by steam, the boiler being in the basement, and the method of heating is the worst that could possibly be devised. Within a year or two the old radiators have been removed, and a line of iron pipe run along the edge of the ceiling as a substitute. These pipes keep the upper strata of air in all the rooms and corridors very warm, while near the floor it is cool or cold. It is a very unsatisfactory and improper means of heating, especially for the insane. We would strongly recommend that this system be taken out and proper radiators put in, so that the heat will be more equally distributed.

The bathtubs are supplied with cold water, but not with hot; provision should be made for furnishing the latter. The privy should be abandoned, and water-closets substituted. The one in use was found to be in an offensive condition, which, with the best of care, it is almost impossible to avoid in an institution of this character. The washing for the asylum is done in the basement of the building, and the wood and coal are stored there. There is a stand-pipe, with hose attached, on each floor of the building, for use in case of fire. The institution needs quite extensive repairing. New floors should be laid, as many of them at present are badly worn. Paint and whitewash should be used extensively throughout the building, and the outside needs painting. In fact, there is nothing about this building that can be commended for an asylum for the insane. If our suggestions could be carried out without incurring a very large expense to the county, we should certainly recommend that the building be abandoned as an asylum, and a suitable and substantial building, with modern conveniences, erected.

The asylum has a male superintendent, and a female attendant for the women. The entire institution is under the management of Mr. and Mrs. J. G. Stiles, and the inmates seem to be well cared for under their administration.

BELKNAP COUNTY ALMSHOUSE.

This almshouse is located in Laconia, about a mile from the railroad station. The location is a pleasant and healthful one,

P. Knox Co. Almshouse

and is in full view of the bay between Laconia and Lake Village. This institution consists of a main house, jail, and outbuildings. It has no insane asylum. There are, on the average, about sixty inmates; at the time of the inspection there were sixty-two, thirteen or fourteen of whom are classed as insane, and six prisoners in the jail.

The jail is located on the southeast end of the house, and connected with the same by a corridor. A portion of it can be seen in the illustration, on the left under the trees. This institution, like many others in the State, has undergone many changes and improvements during the past few years. Three years ago the old jail, which was a disgrace to the county, was demolished and a new one built. At the same time the sewerage system was considerably improved, although it is yet defective.

The main house is a two-story wooden building, with two wings on the west side, one occupied by the male, and the other by the female inmates, while the superintendent's rooms are in the central part of the main house. The buildings are at present ample in size for the needs of the county.

The superintendent and matron, Mr. and Mrs. H. C. Gale, who have recently been placed in charge, have thoroughly renovated all the rooms throughout the entire buildings by painting the walls and ceilings and varnishing or shellacing the woodwork, so that the rooms are now exceedingly neat and clean. This process completely destroys the "almshouse odor." This work was all done by Mr. Gale and his wife, and reflects great credit upon their earnest efforts to place the institution in the best possible condition. Indeed, many of our better class dwellings possess no neater or cleaner rooms than can now be found at this almshouse. Many of the floors were also painted. The bathrooms, water-closets, basement rooms, etc., were all equally clean. A small boiler has been put in the basement, near the boiler used for steam-heating purposes, to supply steam for cooking during the warm months of the year. This is in satisfactory operation. The food was noticed to be of excellent quality and abundant.

This institution has no special ward for its insane, but they are allowed to mingle with the other inmates, with the exception of one or two cases which are kept in confinement. While this arrangement cannot be seriously objected to at the present time,

perhaps, separate apartments must eventually be provided for the insane, and the county ought at once to provide better quarters for the detention of the violent insane.

The jail is a brick building, 38x50 feet, with six large double windows. It contains two tiers of cells, sixteen in number, and 8x8½x9 feet in size. There is a water-closet and pipe for drawing water in each cell. The cells are built of brick, with granite floors, while between the two tiers of cells are iron plates. The corridor, or space around the cells, is large and airy. The prisoners have the freedom of the corridors during the day, and under the encouragement of the superintendent have taken great interest in keeping the jail clean. They have been furnished with whitewash and brush, with brooms, mop, and pail, and all articles necessary to maintain cleanliness. Cuspidores were furnished by the superintendent, and the prisoners allow no tobacco juice on the floors. So far as cleanliness is concerned, this is a model jail.

The institution has two systems of sewerage, — one which takes most of the sewage from the house, discharging in the field a sufficient distance from the house to be unobjectionable; the other discharges a short distance north of the buildings, and at times this constitutes a nuisance, owing to its close proximity to the house. It is understood that the commissioners contemplate extending this sewer so that it may discharge at a suitable distance from the buildings.

The attention of the county should be called to the fact that the institution possesses no means of extinguishing fire except that afforded by the tank in the attic which supplies water for domestic purposes. All the buildings except the jail being of wood, the danger from fire is not imaginary. The present water supply is from the lake, and is pumped by wind power into the tank in the attic. This tank has a capacity sufficient only for domestic requirements, and a second tank is contemplated by the commissioners. These tanks would be of little or no use in case of fire, and cannot be considered sufficient for that purpose. The county should provide hydrants connected with the Lake Village and Laconia water-works, which would furnish an ample supply for all needed purposes. This would necessitate quite an outlay, but the protection afforded to life and property would warrant it.

Carroll Co Almshouse

CARROLL COUNTY ALMSHOUSE.

This institution is located about one mile from the railway station at Ossipee, and is on an elevation favorable to good drainage. The location is very pleasant and beautiful. The buildings are of wood, three stories high including basement, and consist of a main building with one large wing and an adjacent L.

There were, at the time of inspection, sixty-two inmates, about twenty of whom were insane; a few of the latter class are kept in close confinement. There is no separate building for the insane, and those not in close confinement mingle freely with the other inmates of the institution. The need of a separate building or ward for this class is very great.

The entire almshouse was found to be scrupulously neat and clean throughout, and too much praise for this special feature cannot be given the matron, Mrs. Manson. The visit was made Saturday morning, and was without previous notice, and the cleanliness of the rooms, corridors, etc., in fact of every part of the building, was unusually noticeable, notwithstanding the day and hour of the inspection.

The water supply is from a spring upon a hillside nearly a mile distant, and is of most excellent quality and ample for domestic purposes.

The ventilation of the institution has been somewhat improved by the construction of ventilating flues which extend through the roof of the building, and by transoms over the doors of the rooms.

The drainage of the institution is imperfect; the sinks, laundry, etc., are connected with an Akron-pipe sewer which discharges into a field a sufficient distance from the buildings, and by changing its course frequently the sewage is utilized successfully as a fertilizer. The field into which this waste water is discharged produces a very heavy crop of grass each year. The fixtures are not trapped, and the plumbing, what there is of it, is bad.

The institution has but one bathtub, and that is a wooden box made by the superintendent, to which water is brought in a pail. By removing a plug in the bottom of this tub the water escapes into the sewer. This box is placed in one end of the small laundry room. The county should put in at least two good bathtubs, and not depend upon this extemporized affair.

The old men's smoking-room is much in need of a new floor.

The almshouse, although well managed and neatly kept, lacks many of the requisites of a first-class institution of this kind. There is no provision for the separation of the sexes; for this reason most of the inmates have to be locked into their rooms at night. Considering the bad character of many of the inmates at such an institution, this condition of affairs should not be allowed to exist. Separate wards for the sexes should be provided.

There is no protection whatever against fire. A tank should be built in the attic, of ample capacity and connected with proper pipes, to which should be permanently attached a sufficient length of hose to be used in case of fire. The danger from fire is greater at this institution than at any other of its kind in the State, for the reason that it is heated entirely by stoves, thirteen in number. Many of the stoves are run almost wholly by the inmates. The superintendent, Mr. Manson, stated that not infrequently the stoves in some of the rooms are running at their utmost capacity as late as midnight, and that some of the old people get up as early as four o'clock in the morning and start fires.

The institution has no watchman or other person whose duty it is to look after these matters, except the superintendent and matron. The stoves consume over one hundred cords of wood annually.

The principal changes and improvements needed at this almshouse at the present time are:

1. To abandon the stoves, and substitute steam heat therefor.
2. Protection against fire.
3. A new jail.
4. Separate wards for the sexes.
5. Bathtubs.

CARROLL COUNTY JAIL.

Carroll county jail consists of four cells built of stone, brick, and iron, and located in the southwest end of the wing of the almshouse. In 1882, the State Board of Health made a report upon this jail, in which it was stated to be wholly unfit for the detention of prisoners; but thus far the county has paid no

attention to the suggestions then made. To say that it is a disgrace to the county is putting it mildly.

The cells are about 7 x 9 x 9 feet in size. They are dark and dingy, as they contain no window, and the only light which can reach them is admitted through the grated door from a poorly lighted corridor. At the time of the inspection, the cells were so dark that a newspaper could be read in only one, that at the end of the corridor. The corridor is five feet wide, and runs the length of the front of the four cells. At the west end of the corridor is a window, double barred, which has twelve panes of glass 10 x 14; at the other end of the corridor is a window of the same size and barred in the same manner, and opening into a storeroom in the L. This window admits but very little light, so that practically all the light which the jail receives is from the window at the west end of the corridor.

The cells are of brick and stone, with concrete floors which are rough and broken. The furniture of the jail consists of a bed in each cell, five badly dilapidated chairs, an old stand, and a small sheet-iron stove. The jail was dirty and foul. There were present three prisoners, one or two of whom were treacherous, vicious characters. The superintendent stated that these prisoners would break any decent furniture, and persisted in keeping the jail dirty.

So far as a place of confinement alone is concerned, this is the worst place in the State which bears the name of "jail," and when to the existing condition of affairs is added the probability of the prisoners being roasted in case of fire, it becomes, without exception, the worst and most dangerous place for the confinement of prisoners that has ever come to the knowledge of the Board. The building in which the jail is located is, with the exception of the cells, built entirely of wood, and the jail corridor is entered from the main corridor of the almshouse. Two doors have to be unlocked and opened before entrance can be made to the jail corridor. At night each prisoner is locked into his cell by a single key, and the two doors are likewise locked, and the windows are protected by very heavy double bars. In case a fire should break out in the L near the jail or at that end of the wing in which the jail is situated, it might become absolutely impossible to reach the prisoners.

The superintendent has long feared a fire, and has provided a large chain and lever with which he thinks it might be possible with sufficient assistance, and provided the fire was not so hot as to prevent reaching the grated windows, to wrench out the grates, enter the jail, and release the prisoners. This is the only possible means by which they could be rescued should a fire occur in this part of the building.

The sanitary condition of the jail, from every standpoint, is bad. In fact, it has not a single commendable feature, and the county ought at once to abandon it.

Just before the close of the Legislature, the secretary of the Board was given a hearing before the county delegation, on matters relating to the county almshouse and jail. The facts recorded in the above report were presented, with much additional detail, and the needed improvements were specifically stated.

The delegation expressed a unanimous desire to improve the condition of the place, but as the appropriations for the ensuing two years had already been made, they did not deem it advisable to make such recommendations as would involve a large outlay. They voted, however, that the county commissioners be instructed to whitewash the cells and put a small grated window in each; to furnish some practicable means whereby the prisoners could be reached and rescued in case of fire; to supply the almshouse with two bathtubs, one for the male and the other for the female inmates; and to put in suitable traps wherever needed.

It is expected that the commissioners will carry out these instructions promptly and in a thorough manner, besides making such additional improvements as in their judgment the premises require.

MERRIMACK COUNTY ALMSHOUSE.

The building which constitutes the Merrimack county almshouse was constructed about ten years ago, the former buildings having been destroyed by fire. It is situated at North Boscawen, a short distance from the railway station, upon an elevation favorable to good drainage. The main building and the insane asylum are of brick, while the barn and outhouses are of wood.

The main building is two stories in height, not including basement and attic, the latter of which is finished for sleeping-rooms.

From the main building two wings extend westerly, with quite a large yard or court between them. The north wing and the north end of the main building are occupied by the male inmates, while the corresponding portion of the building upon the south is occupied by the females. The central portion of the main building is devoted to the superintendent's uses. There is a separate front entrance to each of the divisions, as will be seen in the illustration.

Steam for heating is supplied from boilers located in a building upon the opposite side of the highway, several rods distant from the almshouse. The radiators are placed chiefly in the corridors, although a few rooms are also furnished with them. There is a transom over, and a ventilating grate in the lower part of each door, so that sufficient warmth is secured in the rooms, excepting, possibly, in the very coldest days of winter, when the inmates may gather around the radiators. The inconvenience thus occasioned is more than balanced by the fact that by this method the rooms are not over-heated and rendered unfit to sleep in.

The building contains a good number of ventilating flues, and, with the exception of the attic, seems to be adequately ventilated. In 1887 this board made a special report to the county commissioners concerning the sanitary condition of the institution. Since that time the commissioners have caused nearly all the suggestions submitted to be carried out. No provision has been made for the ventilation of the attic, but it is understood that it is to be attended to at an early day.

During the past year all the walls have been dressed with paint and kalsomine of a light blue tint, while the ceilings and the walls of the basement have been thoroughly whitewashed. The woodwork is well painted and clean. The bathrooms were found to be in excellent order, having recently been repaired. The water-closets were all in excellent condition, and seemed to be well ventilated. The entire institution presented an appearance of neatness and cleanliness not usually found in institutions of this character. The expense of annually dressing the walls is comparatively light, and at this institution it has been found that

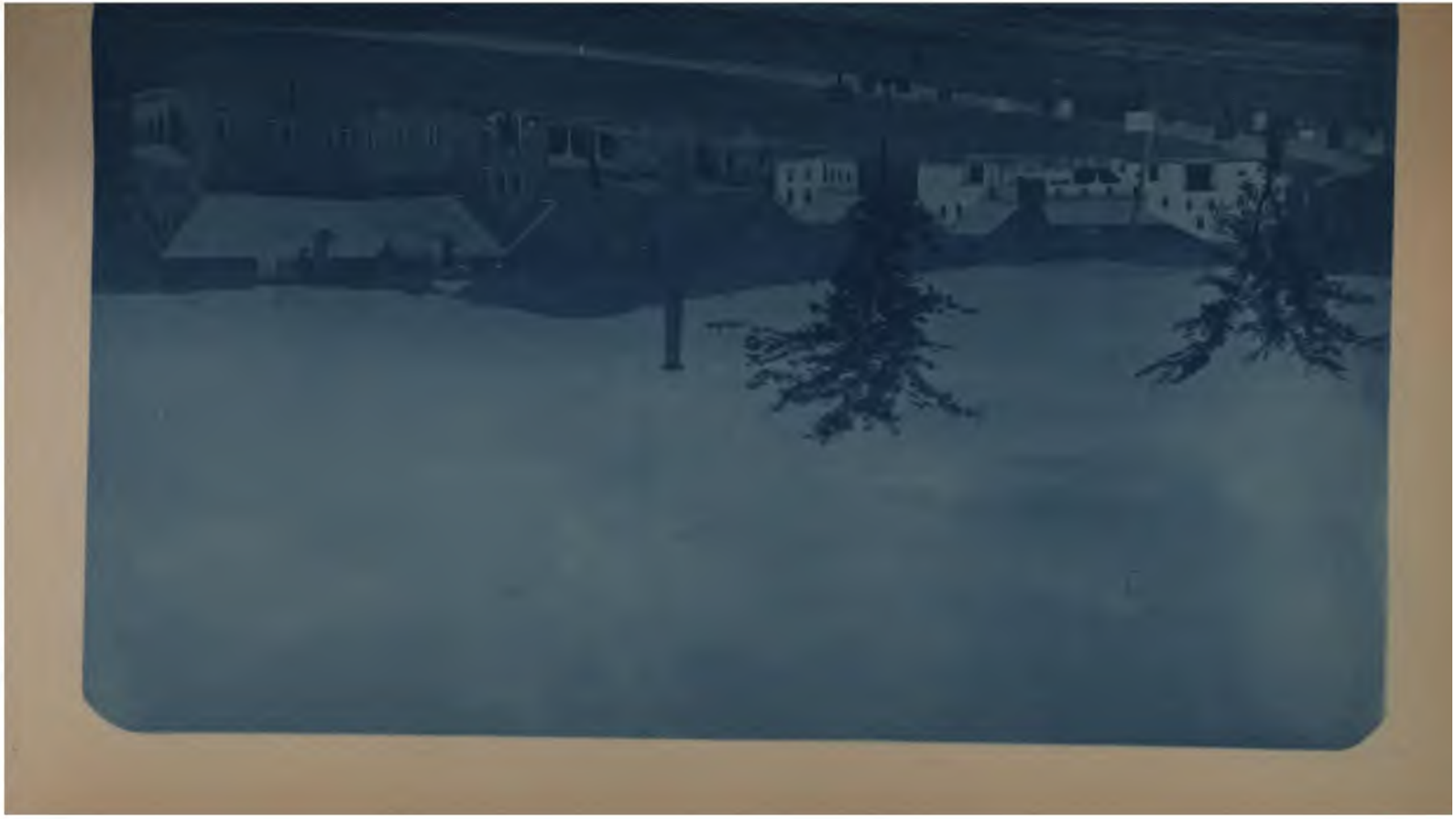
such treatment effectually destroys the "almshouse odor," while it undoubtedly renders the building much more healthful and destroys any vermin that may be carried into it.

The laundry still remains in the southeast corner of the basement, but has been greatly improved during the year by the addition of a series of soapstone tubs. The laundry is too small, and ought to be in a separate building.

The food furnished is of excellent quality, all the flour used being of first-class grade.

The commissioners have added a hot-water system during the year, with sixteen faucets; hot water is now carried over the entire building, and furnished to the bathtubs and set bowls. This is not only a great convenience, but contributes to the comfort of the inmates. The institution has an excellent system of water-works, ample in quantity, and of sufficient pressure for fire purposes. Hydrants are placed at convenient points, and four hundred and fifty feet of hose supplied for fire purposes. Inside the main building there are seven connections with the water pipes, to each of which is constantly attached fifty feet of hose. There are also connections at points about the grounds convenient for sprinkling garden and lawn. It is not exaggerating to say that at the present time this almshouse is in a most excellent condition. There are very few defects to be remedied, and these have been pointed out to the commissioners. The general cleanliness of the entire institution, rooms, clothing, bedding, etc., was, at the time of the inspection, as good as could be desired.

At the time of inspection the institution contained one hundred and five inmates and twelve prisoners, making a total of one hundred and seventeen persons. Of this number about one half may be classed as insane, although but twenty-five are confined in the insane asylum. There were twelve children under fifteen years of age. A part of these are children of the prisoners, and four of them had recently arrived there. Two of the children are idiots. They were found to be well cared for, neatly dressed, and had the full liberty of the pleasant grounds. They attend the public schools, and are thus placed under influences better than those surrounding the children of similar institutions of the State.



MERRIMACK COUNTY ASYLUM.

The asylum for the insane has been greatly enlarged and materially improved in every respect within a few years. About three years ago a new wing was erected, containing twenty-nine rooms 9x10 feet square and nine feet high, and a large and ample hall or corridor suitable for a sitting-room for those not confined to their rooms. After the new wing was ready for occupancy the old building was thoroughly remodeled and refurnished, and is now in nearly as good condition as the new part. The entire institution contains forty-one rooms, only twenty-five of which were occupied at the time of the inspection. In the old building new floors and partitions were put in wherever necessary, the facilities for ventilation largely increased, and the entire building put in a very clean condition. Twelve rooms, designed for the worst class of patients, were connected with the sewer by a 2-inch pipe, there being a slight depression in the floor so that the rooms can be thoroughly cleansed with water from a hose, if necessary. These pipes are thoroughly trapped, and while the inspection discovered nothing objectionable in this instance, there are some doubts as to whether the system is one that sanitarians would endorse.

The buildings are heated by indirect radiation from steam coils. There is a ventilator to each room, which seems to be of ample size to secure good ventilation. The bathrooms were found to be in excellent condition, and the fixtures thoroughly trapped. The buildings are finished in wood throughout, and the ceilings are of the same material, mostly in the natural color, and dressed with shellac or varnish, so that it is a comparatively easy matter to keep them clean. Considerable money has been laid out on the basement of the buildings, to secure cleanliness and ample room for heating flues and sewer pipes. The old building had been in a very bad state so far as sanitary conditions were concerned. The pipes were broken or disconnected, allowing the sewage to be deposited under the building. The commissioners have caused this contaminated soil to be removed, and have put in sub-soil drains.

The building is two stories high, as will be seen by the illustration; the second story is occupied by the males, and the first

story by the females. The worst cases occupy the old building, which has a small yard upon the east side, not shown in the photograph. The patients are allowed to go out of doors in good weather, and have plenty of exercise. The grounds about the buildings have been nicely graded and grassed and present a very attractive appearance.

The sewer system has been extended to the river, so that the insane asylum and the almshouse sewage is conducted to a safe distance from the buildings. All the fixtures are well trapped. Both the almshouse and the insane asylum are a credit to the county; indeed, no better are to found in the State, and it is safe to say that the insane asylum is superior to that possessed by any other county. Last season a new boiler was put into the boiler house, which is located just north of the asylum, thus affording ample facilities for heating. Last winter but one boiler was used, and no complaint was made of insufficient warmth.

We do not hesitate to commend this institution to the consideration of other counties contemplating the improvement of their own buildings.

The almshouse and asylum are under the management of William Tasker and wife.

MERRIMACK COUNTY JAIL.

The Merrimack county jail is located at Concord; it is a brick building, containing ample room for the jailer's family and a jail proper with twelve cells, besides two or three rooms in another part of the building for the detention of female prisoners. The buildings themselves are well constructed, and in a good location. The cells are arranged so as to constitute two tiers, six in each, with an ample court on all sides. Within a year or two the plumbing in the jailer's part and in the wing designed for female prisoners has been thoroughly overhauled, so that in this portion of the building it is in at least a fair condition. The sanitary condition of the remainder of the building may best be described by inserting a letter which was transmitted to the county commissioners:

Board of County Commissioners, Merrimack County, New Hampshire:

GENTLEMEN, — Your attention is respectfully called to the unsanitary condition of the Merrimack county jail. The water supply and ventilation are inad-

equate, the plumbing is in a very faulty condition, and the drainage is not equal to the demands necessary to maintain a healthful condition.

In each cell there is a dirty, dilapidated, cast-iron bowl, originally porcelain-lined, with an insufficient water supply for flushing. These closets are wholly without ventilation, or practically so — an opening in the wall two by two by eight inches, just the size of an ordinary brick, amounts to nothing as a means of ventilation. The twelve cells are practically alike in this respect, the sanitary condition of each being exceedingly bad.

There is an opening in the floor of the corridor to allow the wash-water to flow off the brick or concrete floor, and it is directly connected with the sewer without any intervening trap. The sewer leads directly to a cesspool, a few rods distant from the buildings, the odors from which were distinctly noticeable in the corridor.

We would respectfully recommend that new closets, with proper ventilating flues, be constructed for the cells, and that traps be put in wherever necessary.

In the jailer's apartments the bathtub and washbowl are without traps, and proper traps should be supplied for these fixtures. The small trap under the kitchen sink should be removed, and a trap that cannot be siphoned substituted therefor.

At the time of the inspection the water supply was found to be unsufficient for the demands of the jail. Either the tank capacity should be increased, or a pipe large enough to insure an ample supply at all times of the year should be laid to the street main.

In the basement of the jail is a large opening connected with the sewer; this should either be trapped or discarded entirely, preferably the latter. The opening does not seem to be necessary and is at times offensive.

We would also suggest, as a matter of economy as well as greater protection against fire, that the twelve stoves now used to heat the institution be abandoned and steam heat substituted therefor. This is not recommended strictly as a sanitary measure, but we believe it would be a much better and safer way of heating the building.

We believe the sanitary condition of the jail to be such that your board would be warranted in taking immediate action to remedy the defects. The present condition is dangerous to the health of the inmates, and we believe the health of those confined there should not be jeopardized by waiting for the action of the county delegation in regard to the matter.

Should your board decide, as we hope and expect you will, to remedy the present unhealthful conditions at the jail, this Board would gladly render any assistance desired in suggesting the necessary changes and the manner in which they can best be carried out.

With the exception of the defects mentioned, the jail was found to be in first-class condition; it was clean throughout, and the indications pointed to general good management and careful oversight in all its departments.

HILLSBOROUGH COUNTY ALMSHOUSE.

The Hillsborough county almshouse is located at Wilton, about five miles distant from the railway station. The buildings consist of the almshouse proper, A; the old men's home, B; the old women's home, C; the asylum for insane females, D; the asylum for insane males, E; the boiler house and laundry, F, and the superintendent's residence and various out-buildings.

Within a few years several marked improvements have been made at this institution, among which may be mentioned an increased water supply, an additional boiler for laundry and cooking purposes, a storehouse and vegetable cellar, the construction of a separate building for the old men's home, an enlargement and improvement of the insane asylum for females, an extension of the nursery for children under five years of age, besides several improvements of lesser magnitude.

All the buildings are of wood, except the superintendent's house and the boiler house, which are of brick.

The almshouse is an old building, three stories in height, poorly constructed, and ill adapted for the needs of a county having so many poor as has this. The building is considerably worn and shows the want of paint upon the outside. The old men's home and the insane asylum for females are in a very good condition. The insane asylum for men is an old and poorly constructed building, not adequate to the needs of the county. The remaining buildings are in very good condition.

This institution, as a whole, consists of an aggregation of buildings so closely situated that the danger from fire is greatly increased. It is unfortunate for the county that its buildings are not fire proof and better arranged, both for the comfort of the inmates and for convenience in administering to their wants.

An inspection of the interior of the buildings showed them to be in excellent condition, so far as cleanliness and general management are concerned. All the rooms were found to be neat and clean, giving evidence that the superintendent and matron appreciate the value of thorough cleanliness. The beds were in good condition and clean. All the beds in this institution have fresh clothing once a week, and oftener if necessary.

During the past year the nursery has been enlarged, making it

Hillsborough Co. Almshouse & Insane Asylum

about 20x32 feet; its former size was about 13x22 feet. It contains, on an average, about twenty-six children, ranging from a few months to five years of age. This room is perfectly clean and neat, with whitewashed walls and well painted floor. The children looked bright, intelligent, and were well dressed. The playground is upon the west side of the building, and to it the children have access at all times when the weather will permit. The larger children are allowed outside this yard every pleasant day.

The insane asylum for females contained, at the time of inspection, sixty-four inmates. There are thirty-seven sleeping rooms, besides sixteen beds in one attic and fourteen in another. There is no classification of patients. The building, in addition to the rooms mentioned, contains a large dining-room, which presented a neat and tidy appearance. The rooms were all in very good condition.

The asylum for men, as before remarked, is an old building, improperly constructed, and in every way poorly adapted to its requirements. But very few persons are confined in this building, as many of the men are able to do some work upon the farm during the day.

The old men's home contains eleven rooms on the first floor and twelve on the second. Several beds are also placed in the attic, although not at all times occupied. The building is clean and neat, and is a source of much comfort to the old men who occupy it.

The old ladies' home was also found to be in good condition throughout. In the upper story of this building is the schoolroom, which contains forty-four chairs and desks, and was neat and clean, and had maps and instructive mottoes upon the walls.

The value of whitewash in an institution of this character is thoroughly recognized by the superintendent, and two of the inmates are kept at work with the whitewash brush during a considerable part of the time. This adds greatly to the cleanliness and healthfulness of the institution.

All the cooking is done in the basement of the main building by steam.

Among the improvements now needed are the following:

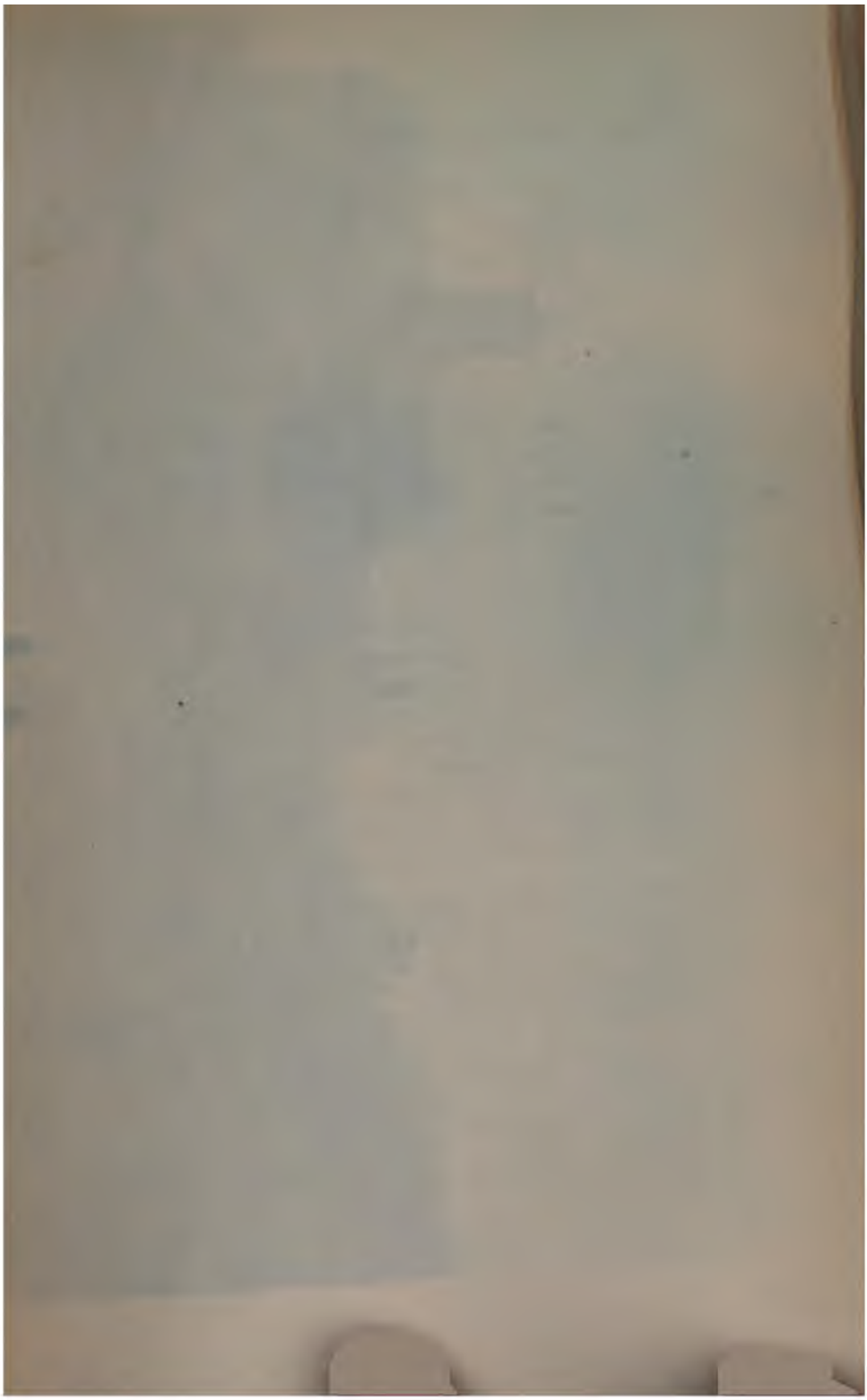
1. A new sewer system. The present system is exceedingly

faulty, and this Board has twice reported adversely upon it. In 1883 and 1888, in the published reports of those years, the system was criticised as faulty and unsuitable for the institution. The criticism then made still holds good, except that we believe after the report of 1883 some traps were put in, which rendered the sewer less offensive. The sewer takes only the waste water and slops of the institution and discharges in the open field quite a distance from the buildings. The privies of the institution, of which there are four, are a constant nuisance, and very objectionable. There is a manhole connected with the sewer in the center of the yard, into which slops and waste water from some of the buildings are poured. This was found to be in an offensive condition and is an unqualified nuisance. The county should put in a complete and perfect system of sewers, including water-closets for the various departments, and abandon the privies. At an institution like this, privies, at the very best, are a constant nuisance.

2. Greater protection against fire is needed. There is no water pressure that would be of any service whatever in case of fire. The commissioners have attempted to provide means for extinguishing fires, by placing pails of water upon shelves at convenient points. This arrangement would offer no protection in case a fire got under headway before being discovered. A large tank of water in the roof of the main building, with distributing pipes for the other buildings and to such points in the main building as might be thought advisable, and provided with permanently attached hose, would greatly lessen the danger of an extensive conflagration.

There are other improvements which will doubtless suggest themselves to the commissioners, among which is the painting of the outside of the main building.

Aside from the criticisms made, the institution is in an excellent condition, and it is evident that no trouble is spared by the superintendent and matron, Mr. and Mrs. J. Garvin to make this a comfortable home for the unfortunate inmates. The institution contained two hundred and seventy-five inmates and eleven prisoners at the time of the inspection.



Cheshire Co Almshouse

CHESHIRE COUNTY ALMSHOUSE.

This institution consists of a three-story main house and a two-story L, both of which are substantially built of brick. It is located at Westmoreland, on the Connecticut river, and has connected with it a large and fertile farm. The buildings were constructed about twenty-two years ago, and at that time it was undoubtedly the best appointed almshouse in the State; the rooms are of ample size, and the arrangement convenient.

The main building is divided longitudinally into two parts for the sexes, and the two departments are constructed very much alike. On the first floor in the L is the kitchen for both wards; the cooking is done over a large range in which coal is used. Hot and cold water are provided for all parts of the building. In the main house, on each side of the division, are dining-room, hall, sitting-room, sinkroom, bathroom, and closets, on the first floor. On the second floor of the house, on the female side, are two large sleeping rooms, one with eight beds and the other with nine. On the male side, the arrangement is substantially the same, with seven beds in one room and six in the other. In the third story, on the female side, are the chapel and several sleeping rooms; on the other side, a sleeping room containing six beds for the men. On the fourth floor are eleven sleeping rooms, originally designed for prisoners, but since the construction of a county jail at Keene they have been used mostly for sleeping rooms by the inmates.

All the bedsteads in the institution are of iron with thin wooden slats running lengthwise of the bed; on this is a straw mattress and the usual amount of bed clothing. All the rooms seemed to be well cared for, and although the inspection was made early in the morning, the premises were found to be in very passable condition.

The institution contains a very intelligent class of inmates as a whole, and what was more particularly noticeable was the fact that they were nearly all Americans, and most of them had passed their entire lifetime within the county. Among the old men and women present were many faces that indicated a very large degree of intelligence, and but for some misfortune they would not have been found at an institution of this kind.

The buildings seemed to be well sewered; an Akron pipe conducts all the sewage to a point on the farm nearly one hundred rods distant, where it is used for fertilizing purposes. The plumbing is of fair quality, although the traps under several of the sinks are not modern fixtures, and whenever repairs are made they should be replaced by some which cannot be siphoned.

The very few insane persons which the county maintains at this institution, incurable cases, are confined in the second story of the L. In this department there are six rooms about 8x10 on the floor and 11 feet high, with one good-sized window, protected by an iron screen, for each room. Each room has a bed like those in the other part of the institution. There is a transom over each door, but beyond this there is no means of ventilation; in each room is a small radiator for heating purposes.

It should be said in connection with this subject that Cheshire county has for several years taken a position in advance of the other counties of the State in caring for her insane. This county has for a long time past maintained at the New Hampshire Asylum for the Insane nearly twice as many inmates as any other county in the State, notwithstanding it is one of the smallest. These humane efforts in the management of its insane reflect great credit upon the county.

At the end of the main building is a small, one-story, wooden structure used chiefly for a laundry, although in a corner room was found a partially demented man suffering with some form of chronic disease. This was a bad and offensive case, but the quarters in which he was located seemed scarcely suitable, notwithstanding the circumstances of the case. This wooden building, however, is to be removed early in the spring, and a substantial brick building erected for the purpose of furnishing the institution with an ample laundry and also for the detention of the incurable insane.

The water supply of the institution is abundant and of most excellent quality, coming from springs on the distant hillsides. The buildings are heated by steam, and judging from the number of radiators, which seemed to be well distributed, there ought to be no complaint of cold. At the time of inspection there were sixty-four inmates.

The institution is at present under the management of Mr. H.

B
A
F
Sullivan Co. Almshouse & Insane Asylum

D. Pierce, wife, and daughter, who have occupied this position only a few months. The superintendent's residence is not connected with the almshouse; it is a cottage house with an L, and is evidently suitable for its purpose.

SULLIVAN COUNTY ALMSHOUSE.

This institution is located at Unity, about four miles from the nearest railway station, Claremont. It contained at the time of inspection sixty-five inmates, six confined in the asylum for the insane, and twelve children under ten years of age. The children attend the district school.

In 1883 this Board made some criticisms upon the condition of the buildings, accompanied by recommendations, some of which have since been carried out. The changes made since that time consist of an improvement in ventilation; the fitting up of bath-rooms; the substitution of steam heat for the thirteen stoves which were formerly required to heat the building; the building of an asylum for the insane to take the place of the miserable pens in the second story of an old shed in which these inmates were formerly confined, and a marked improvement in the general sanitary condition of the institution over that of former years. All this has been done since 1883, at which time the buildings were in a deplorably bad condition.

The buildings consist of the almshouse, A; the asylum for the insane, B; the superintendent's house, C, besides stable, sheds, and other out-buildings.

Notwithstanding the institution has been so materially improved during the last few years, there is still considerable that ought to be done. The floors are in a very bad condition, and with the exception of two rooms have never been painted. They were laid of spruce boards, evidently not well seasoned, as evidenced by the wide cracks, and they have worn so rough that it is with difficulty they can be washed. The door sills are also badly worn, some of them nearly through. The walls, as well as the ceiling, are badly cracked and broken, and should be thoroughly repaired and dressed with whitewash or some other preparation. Owing to the facts above stated, it is impossible to keep the house free from vermin, the fissures and cracks offering a safe hiding place,

although by constant care the matron is able to keep them reduced in numbers.

The plumbing and drainage are defective and should be reconstructed. The bathtubs, as well as the sinks connected therewith, both upon the men's and the women's side, are without traps. The drainage from the kitchen is also defective in a like manner. The privies to both the main house and the asylum were in a very bad condition, those connected with the main house constituting an every-day nuisance. They should be abandoned at once and a water-carriage system substituted. It is understood that the commissioners have given this subject some consideration, and the improvements will probably be carried out within a short time. The water supply of the institution is of fine quality and ample for domestic purposes, so there is no obstacle in the way of making this change.

The asylum for the insane contains eight rooms. At the time of the inspection six inmates, females, were constantly confined in it. This building is new and in very good condition, with painted floors and good walls. The ventilating flues placed in each room are too small. In those rooms in which the windows were closed the atmosphere was quite offensive. The attic should be provided with a ventilating flue, as it was closed and exceedingly hot and thus prevented a free circulation of air. When this building was constructed, a system of ventilation was put in by the commissioners which was undoubtedly considered ample at that time, but which experience has proved insufficient. There is no attendant at the asylum at night or other time, except when the matron or her daughter goes there. The bathtubs of the asylum are untrapped.

Regarding the general cleanliness of the entire institution, it may be said to be in a fairly good condition. No pains is spared by the matron to do all in her power in this direction, and whatever was observed to be incompatible with cleanliness was due to the structural defects of the building rather than to neglect.

There is no provision for extinguishing fire, other than with pails. A stationary ladder is placed upon the side of the building and extends over the roof, but this would avail nothing if the fire should get under headway. We would suggest that a tank be built in the attic, with a proper distribution of pipes, and hose

connected therewith, for the purpose of rendering the buildings more secure from fire.

The institution is under the management of Mr. and Mrs. Martin A. Herrick, who have held the position about five years.

The following is a copy of a letter submitted by the county delegation to the commissioners of Sullivan county:

THE STATE OF NEW HAMPSHIRE.

HOUSE OF REPRESENTATIVES,

CONCORD, July 30, 1889.

To the County Commissioners of Sullivan County:

The visit to the county farm on the 5th inst. by the county convention, leads that body to make to you the following suggestions:

1. Good husbandry would seem to require that the barnyard should be kept dry, in order that stock may be healthy and milk from cows be free from filth, to accomplish which an eaves spout should be placed on the south side of the barn, and extended westerly far enough to carry the water away from the roof westward of the barn; that the stone wall upon the south side of the yard should be removed and replaced by a board fence; that suitable drains should be constructed to carry off the under-ground water, and the yard be properly graded. It is believed that this will render the yard dry and fit for its purpose.

2. The hog pens should either be placed at such distances from the house as to prevent odors therefrom from reaching its occupants, or be frequently cleaned and dry earth or other absorbents introduced.

3. This body would recommend that you employ some competent carpenter to remove so much of the woodwork beneath the privy seats as is necessary to make a cleanly reconstruction thereof, and then place such conduits as are usual in other public buildings, with the necessary water tanks above them, and then either make a drain to carry all excretory matter to a proper distance, if practicable with the present water supply, by the use of flushing apparatus, otherwise provide iron receptacles that can be emptied and cleansed daily, or as often as shall be found necessary.

4. That this body is of the opinion that all the foregoing improvements might and ought to be made, under your direction, by the superintendent with the assistance constantly at his command, and without expense to the county, except the carpenter's work and the plumbing.

In accordance with the recommendations of the Board and the county delegation, the commissioners have commenced the improvements suggested.

GRAFTON COUNTY ALMSHOUSE.

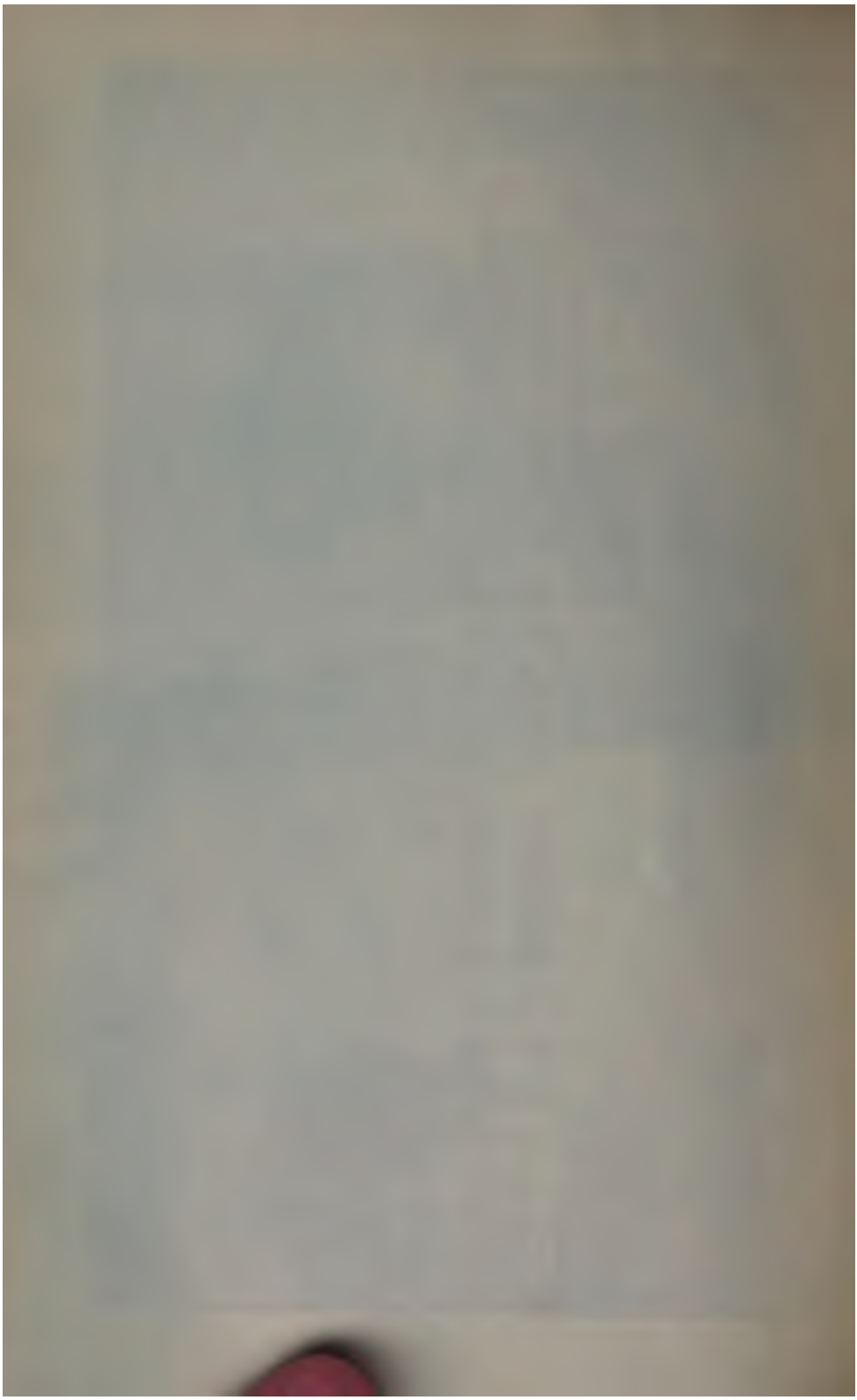
This institution was first inspected by the board in 1882, since which time several other inspections have been made. It is gratifying to say that during that period several material improvements have been made. The buildings which originally existed upon this farm were burned several years ago, and the present almshouse was built by the county especially for the purpose to which it is now applied. These buildings consist of a main house, A, with two wings, one on the east, B, and the other on the west side, C, as shown in the illustration. The insane asylum, D, is situated still farther west and is connected with the west wing of the almshouse by a covered walk. The east wing (shown at the right hand in the illustration) is occupied by the female, and the west wing by the male inmates.

Among the improvements which have been made from time to time, at the recommendation of this Board, are an increased water supply for domestic purposes; a better system of ventilation; an improvement in the sewer system; increased facilities for cooking by steam; the erection of a brick building for boiler and wash rooms; the remodeling of the insane asylum, and the construction of a large addition thereto, and other improvements of minor importance.

The buildings are located in Haverhill, upon a tableland rising above the Connecticut river, about a mile and a half from Woodsville. The location is delightful, with pleasant surroundings and scenery.

The general cleanliness of the institution was noted, but some repairs are necessary. The paper on the walls, and in some places the plaster itself, is badly broken and marred. This should be repaired, or, better still, the old paper should be taken off and the walls dressed with kalsomine, alabastine, or paint. In one or two places the plaster overhead is broken and needs repairing. In some parts of the building new floors are needed. The woodwork should all be painted, — in fact, the interior of the building should be re-dressed throughout. The women's bathroom also needs some repairs. The water-closets are in fair condition, and the general ventilation of the building has been somewhat improved during the year. The beds and furniture are in very good

D
C
B



condition. The food provided for the inmates is of good quality and abundant.

Since our last report was made an addition to the asylum has been built, (shown in the illustration by the lighter color of the new shingles), containing sixteen rooms, eight upon each floor. The rooms are 8x9 feet on the floor, and each has a large window and latticed door, so that heat and ventilation are secured. The windows are protected by screens. The attic contains two good-sized halls, where the inmates may meet to visit or for any other social purpose. A water-closet is provided for each room, with a ventilating pipe connected with the main flue of the building. All the rooms are sheathed with wood. The entire asylum is very well arranged, and is probably ample for the county for many years to come. On the average, about fifteen persons are confined here. The asylum has an excellent cellar or basement, which is used for a vegetable cellar and storeroom. The entire institution contained at the time of the inspection one hundred and eighteen inmates.

The attention of the county should be called to the inadequate protection of the buildings against fire. The present water supply is only sufficient for the domestic needs and for sewerage purposes, the source of supply being a well and a spring upon the hillside northeast of the buildings. From this source a sufficient supply for fire purposes cannot be obtained. It is suggested that a reservoir be built upon the hill and filled from the river by pumps. The present boiler capacity is sufficient to do the pumping, and the proposed measure would not require a great outlay. Protection against fire is urgently demanded, and this would seem to be the most feasible plan. Should the buildings now take fire, unless it was discovered immediately they would most certainly be destroyed. Even though the property may be fully insured, the risk to life is far too great to excuse any neglect in this direction. This matter should be brought before the county convention.

The money appropriated for the purpose of enlarging the insane asylum was well expended, and we have no doubt that every member of the county delegation would be pleased with the results. We predict that the same would be true in respect to the proposed water supply for fire purposes, even though this

measure, like the other, should meet with more or less opposition.

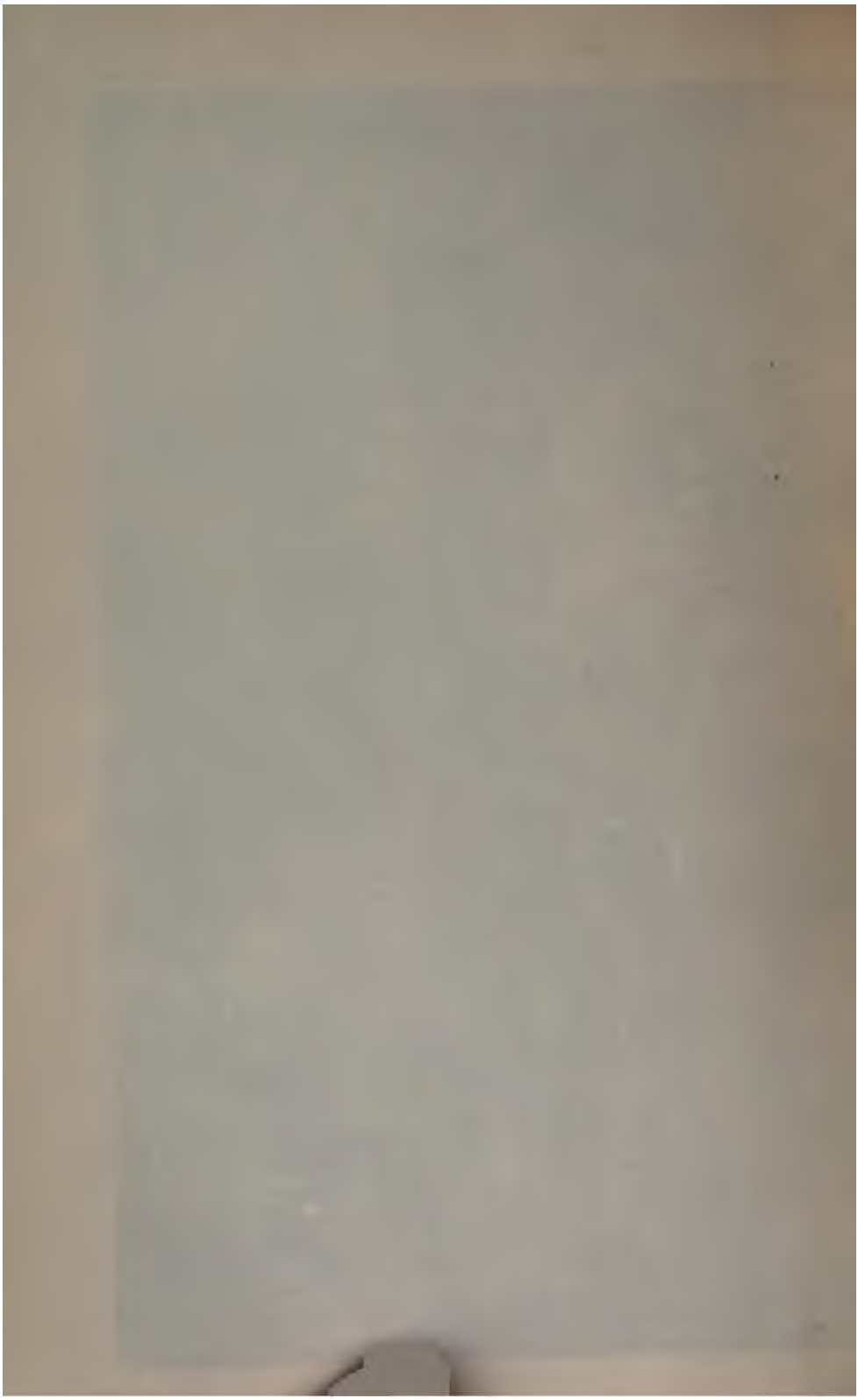
This institution as a whole is a credit to the county. Like all others of its class, it has come to its present state through a series of evolutions, and it is not to be supposed that the time will ever arrive when all outlays upon these institutions will cease. Improvements and alterations of a greater or less magnitude are needed every year, and the county should take pride in making these homes of their unfortunate poor not only endurable but comfortable and healthful. H. R. Norris, superintendent.

Since the above report was rendered, the county has made several improvements. Plastering and ceilings have been repaired, walls and floors repainted, the bathrooms and water-closets overhauled and remodeled, and other alterations made.

COÖS COUNTY ALMSHOUSE.

Coös county was unfortunate in having a set of farm buildings as a nucleus about which to build an almshouse suitable for the wants of the county, but improvements and additions have been made from time to time until the institution now presents, upon the whole, a condition which fairly well fulfils the requirements of a county almshouse. The improvements which have been made during the past ten years consist of an enlargement of the buildings; in doing away with stoves and substituting steam heat therefor; in building a large and substantial barn, adequate for the wants of the county for years to come; in putting in a better system of sewerage and drainage; in the construction of a building for the boiler and for laundry purposes; the addition of bathrooms; the discontinuance of old and filthy vaults, and the substitution of latrines therefor; the enlargement of the water supply, making it ample for fire purposes; the building of fire escapes; an improvement in the condition of the ward for the insane, besides numerous alterations of minor importance. With all these changes the institution is, of course, in a much better condition to-day than ever before, and yet the buildings are not as good or as well arranged as could be desired, or as would have existed had they been originally constructed for the purpose to which they are now applied.

The illustration gives a very good idea of the exterior of the buildings. The main house is practically four stories in height,



since the buildings are situated upon land sloping toward the Connecticut river, giving a basement story on the west side of the house. Light is admitted to the east side of this basement story by means of area windows. The attic is finished, and used for sleeping rooms when necessary. The superintendent and family occupy the two-story L, which joins the main building at its south end; then follow the shed, carriage-house, stable, and barn in the order named. These buildings are beautifully located at Stewartstown, and from them may be had a magnificent view of the Connecticut valley, with the villages of West Stewartstown, and Canaan, Vt.

The present superintendent and matron, Mr. and Mrs. Hannaford, have been in charge of this institution for more than twenty years, and it is not necessary to repeat what has been said in former reports concerning the general management of the institution. Our inspections have always been made without previous notice, but we have never failed to find an excellent state of cleanliness throughout. The kitchen, laundry, sleeping-rooms, schoolroom, in fact all the various departments are kept scrupulously neat and clean. The food furnished the inmates is of excellent quality and abundant; the beds are good, clean, and have an abundant amount of clothing. The plastering on the walls of some of the rooms, and overhead throughout the entire building, is in a very bad condition; in several places large patches of plaster had dropped off. A large part of the building ought to be replastered at once. Considerable of the woodwork needs painting. In this connection we would suggest the plan which has been adopted at the Belknap and Merrimack almshouses, that of using no paper upon the walls, but dressing them over once a year with kalsomine, alabastine, or paint, while the woodwork should be painted as often as necessary. The dressing of

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On Friday, June 17, 1889, after this report had been written, the Coös county almshouse caught fire from a burning chimney. The roof was nearly destroyed, and the building thoroughly saturated with water, and it was with considerable difficulty that the fire was extinguished. The inmates were removed from the building as soon as the fire was discovered, and nearly all the furniture was also taken out. Had it not been for the additional water supply which was put in for such an emergency a little more than a year ago, the buildings would have been totally destroyed. This occasion certainly emphasizes the wisdom of the county in making an appropriation for building the additional reservoir. The hydrant is situated on the opposite side of the road from the house, some fifty or sixty feet distant, and is covered by a small wooden house. Considerable search had to be made for the key to this

the walls annually, as suggested, has a remarkable effect in purifying the institution, and almost entirely destroys the "alms-house odor," while there is no question but it has a good effect in rendering the institution more healthful. The expense of this work is very small, and the results are very marked both to the eye and the sense of smell.

As an additional precaution against fire, we would suggest that one or two stand-pipes be put up through the building, with a sufficient length of hose permanently attached to each pipe and ready for immediate use. This might be the means of saving the building from destruction by fire, especially if one should break out during the night.

The greatest need of the institution at the present time, in the way of buildings, is a more modern and suitable asylum for the insane. They are at present confined in a separate building, west of the main building, and some seventy-five feet distant. This structure is a long, one-story building, in one end of which is the boiler-room and laundry, and in the other the latrines.

That portion containing the boiler and laundry was recently built, and is in good condition; the other portion is old and wholly unfit for the confinement of the insane, although this part was somewhat improved three or four years ago. This ward contains about fourteen small rooms or cells, some of which are only 5x8 feet square and about nine feet in height. At the time of the inspection this ward contained five inmates, three women and two men. The county should provide better quarters, especially for the better class of its insane. These rooms are suitable, perhaps, for the confinement of some of the worst patients that come to an institution of this character; but they do not possess the conditions necessary to health or comfort.

The institution is well managed, its unfortunate inmates well

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house, and the hose was brought in sections and had to be coupled together, all of which occasioned some delay, and the fire had gained good headway before a stream of water could be played upon it. It should be remarked that the superintendent was away at the time; had he been present there would probably have been less delay. Under the circumstances, had the fire occurred in the night, or had it been less promptly discovered, the buildings would have been destroyed. In addition to the standpipe suggested above, we would recommend that a full line of hose be permanently attached to the hydrant; it would then be ready for immediate use, day or night. The buildings were well insured.

When the repairs are made, the commissioners should see that the improvements above suggested are carried out, as they undoubtedly will.

cared for, and it is more than probable that with the spirit which the county has manifested of late years, the improvements suggested will be carried out from time to time, so that, eventually, the institution in all its appointments will be second to none in the State.

Following the occurrence alluded to in the foregoing footnote, the county, in addition to repairing the roof, caused a large part of the building to be repainted and replastered, so that the building is now in a much better condition than before the fire. Recently Mr. Hannaford, who had been superintendent for many years, resigned, and Freeman G. Marshall was appointed in his place.

COÖS COUNTY JAIL.

In 1885 the State Board of Health, in its fourth annual report, said of this institution, "This penal institution is located at Lancaster, and is wholly unfit for the purposes of a jail. It is too small by far for this county, and is frequently over-crowded. The sanitary appointments are very defective; the drainage and ventilation are both insufficient. One of two things is necessary, either to build a new jail, or to entirely remodel the present one. Probably the latter would be attended with less expense, and would suffice for a few years.

"An extension might be made upon the east side of the present jail, which should be ample for at least four more rooms.

"Water-closets should take the place of the present offensive vault, and better ventilation should be secured. The board of county commissioners should make a careful estimate of the amount of money required to make the needed changes, and lay the whole matter before the county delegation, and ask for a sufficient appropriation to do the work necessary to place this institution in a better condition."

Up to the present time no changes for the better have been made in this institution since the above report was made. Indeed, we are informed that for the past eight years no improvements have been made at this jail, other than those made by the jailer with his own hands.

This jail is a standing disgrace to the county, and the buildings

connected with it, consisting of jail-house and barn devoted to the use of the jailer and family, are in a shabby condition.

The jail proper is a one-story stone building, and contains three rooms, one of which, 10x20 feet, is common to all during the day, and two cells 8x10 feet; the rooms are nine feet high, and each contains a bed. There were four prisoners at the time of inspection.

In one corner of the large room is a privy, 2x3 feet on the floor, and both the jailer and the prisoners stated that it was a constant nuisance, the prisoners, particularly, complaining bitterly of it. In one corner of this room stood the bed, and in another the stove. Near the stove was an old barrel which served as a woodbox and was also the receptacle for an old broom. The remaining furniture consisted of an old broken table and two chairs without backs. The two other rooms contained substantially no furniture except the beds.

We were informed by the jailer that at one time he had thirteen prisoners confined in these three rooms, and that twelve of them were thus detained all summer. To add to the horrors and disgrace of such a condition it should be stated that the jail has no yard whatever. There is no sink, and all water for personal use and for washing is poured into the vault above mentioned. There is no sewer whatever connected with the jail.

It is fully time that this disgraceful and inexcusable condition should be considered by the county delegation, if not by the whole people of the county. A sufficient appropriation should be voted, if not to build a new jail, to enlarge the present one, and to so change and improve it that the county shall have a respectable place for the detention of prisoners.

It may be remarked by those possessing but a grain of humanity, that such a place is good enough for a criminal; but they should remember that frequently persons innocent of crime are detained in jail as witnesses, being unable to furnish bonds for their appearance at court; persons are also held upon suspicion, for crimes of which they are guiltless. On the other hand, those persons who believe that punishment should be reformatory, will insist that all prisoners be properly and decently cared for, whatever may have been their crime or previous condition.

Subsequent to the writing of the above report, and during the

session of the Legislature, the secretary of the Board interested the county delegation in this matter, and invited them to examine the Belknap county jail at Laconia. The delegation were much pleased with this building, but believed that one somewhat smaller would be sufficient for Coös county. At a subsequent meeting of the delegation the following vote was passed:

"*Resolved*, That the sum of five thousand dollars be and hereby is appropriated for the purpose of building a new jail on the site of the old one at Lancaster."

It is understood that the new building will be commenced in the spring, and that the present disgraceful place of detention will then be demolished.

RAILROAD INSPECTIONS.

For several years this Board has made an annual inspection of the stations and grounds of the various railroad lines in the State in the interests of sanitation, and has rendered an annual report upon the same. During the past year the inspection was not made from station to station, but from observation while traveling over the several lines, and in visiting many towns in the regular work of the Board, extending through the whole year.

It is three years since these inspections were commenced, and in that time there has been a very general improvement in the sanitary condition of our railway stations and grounds. It is true that in some instances there is a lamentable neglect to make alterations and improvements recommended by this Board as well as by the railroad commissioners. The condition of the station at Newmarket Junction illustrates this point perhaps better than any other in the State. This station is jointly owned by the Boston & Maine and the Concord Railroads, and the deplorable condition is probably the result of a lack of co-operation between the two lines. It may be stated that the directors of both lines have taken action in the direction of erecting a new depot at this station, and we hope to see the much-needed improvement carried out at an early day. The uncertainty as to who would eventually own or control the Northern and the Boston, Concord & Montreal

roads has been somewhat detrimental to needed improvements, although the general sanitary condition is good, with a few local exceptions, for which the agent, rather than the management, is responsible.

The Boston & Maine Railroad has done more to maintain clean and neat grounds about its stations than any other line in the State, and the sanitary condition of its depots, taken as a whole, is excellent. This remark is applicable to most of its leased lines in New Hampshire, especially in the eastern part of the State. During the year increased facilities for water supply have been provided at some stations, and other sanitary measures have been carried out.

The Boston & Lowell system is not so well equipped in this respect. Some of its stations are open to severe criticism, particularly on the line between Nashua and Keene. Some of the stations on the Boston, Concord & Montreal road also need to be reconstructed. The existing condition is very largely due to the unfortunate uncertainty in the past regarding the future proprietorship of the road. In the face of this fact, however, some necessary changes were made during the year. The same remarks are applicable to the Northern road. The executive officials of these several lines realize the importance of good sanitary administration in railroading, and it should be understood that the delay in making contemplated improvements is due to this unsettled state of railroad affairs.

The Concord Railroad stations are in a very good condition, much better than formerly. During the past few years, many substantial and long-needed improvements have been made, both upon the main line and leased roads. At some stations sufficient care has not been exercised to keep the closets and privies in a cleanly condition. The water-closets at Nashua are at times very offensive, simply from neglect to take proper care of them. The Newmarket nuisance has been above referred to. This road, however, has made several needed improvements during the year, and its course of action in respect to sanitary advancement is highly commended.

The tendency in the management of all the roads in the State is toward better and cleaner stations and grounds. The requirements, comfort, and even tastes of the traveling public are more

generously and carefully considered than formerly, and when our railroads shall finally become settled under some fixed administration we may hope for an era in which there will be little or no cause for complaint against the sanitary conveniences and conditions of our railway lines.

TRANSPORTATION OF DEAD BODIES.

The lack of uniformity in the regulations governing the transportation of dead bodies led the National Association of General Baggage Agents to attempt to secure throughout the United States and Canada the adoption of uniform regulations. To this end the association mentioned formulated a set of regulations in July, 1888, which were submitted to the state boards of health, the National Conference of State Boards of Health, the American Public Health Association, the National Association of Undertakers, and other organizations, for the purpose of obtaining suggestions, criticisms, etc., which would lead to ultimate uniformity of the rules designed to be adopted by health authorities and by the railroads. The regulations submitted were accompanied by the following remarks:

"In submitting these rules for your consideration, it is not assumed that they are now perfect, and we are simply asking your approval of them; on the contrary, we solicit any suggestions or recommendations which, in your opinion, will be in the interests of the public health, and at the same time not unnecessarily burdensome and expensive to the public.

"It is a noticeable fact, that infectious or communicable diseases follow more quickly the lines of communication, being spread by the movements of the people; and as the railroads are the principal mediums of communication among the people, the trunk lines spanning the continent bringing to our doors inhabitants from all parts of the country, it is patent to all that local rules, be they ever so rigid, can afford but partial protection, and as the bodies of the dead are transported in the same cars and

among the baggage containing the wearing apparel of the passengers, the necessity for some effective rules, which will apply the same in Pennsylvania as in Colorado, is the most apparent. Cannot this be accomplished, and may we have your co-operation to that end?

"In looking over the above rules, the following inquiries are suggested: Is it policy to have a list of specified dangerous diseases that will not be carried, as in rule 1, and should this list stand, or be extended?

"There being a difference of opinion among health officers as to danger in transporting bodies dead of certain diseases, should we not take the safe side in case of doubt as in first part of rule 2?

"Will the rule for preparing bodies for shipment be effective, or should there also be an injection of fluids in the cavities? What should be the extra expense of thus preparing dead bodies?

"What should be the additional expense of ordinary air-tight zinc, copper, lead-lined, or iron coffins or caskets as compared with other ordinary coffins or caskets that are not claimed to be air-tight? The question of expense in this matter is a very serious one, and of course must not be overlooked; will this scheme be prohibitory in the case of people of ordinary or limited means?

"Is there any standard by which undertakers are graded to ascertain whether competent or not? are they examined before being allowed to practice the art of embalming, as are physicians before practicing their profession? if not, what assurance have the public of any safety, even though a certain undertaker made oath that he had prepared a body for shipment in accordance with the rules? Should not each State require undertakers to take out a license and pass examination before a competent board of examiners before he is allowed to prepare a dead body for shipment out of that State?

"Is there any penalty in your State for making false affidavit or issuing false certificate, either as to cause of death, or as to preparation of the body for transportation? and if not, should there not be some legislation that will give the necessary protection? Who in your opinion should look after this matter?

"Is it not desirable that all permits for the removal of dead bodies be issued by the boards of health, and can this not be done in all cases even in small towns or country districts?

"Is it not desirable that a nearly uniform style of removal permits be used, to insure definite and necessary information, to enable persons to transport dead bodies through several States without danger of being stopped at some intermediate point? Please send samples of permits used in your territory.

"To enable the committee to prepare their report, we would request that all communications on the subject be sent to the secretary at Detroit, Mich., on or before December 1."

Suggestions were received by this association from the health authorities of all the States and from Canada, and as a result a new set of rules was formulated. Regarding this subject, the following letter was received:

BOSTON, MASS., March 21, 1889.

Dr. I. A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR SIR, — We, the undersigned, general baggage agents of the railways interested in the matter of transporting dead bodies in the State of New Hampshire, would respectfully call your attention to the corrected rules and samples of forms approved at the San Francisco meeting of the National Association of General Baggage Agents, of which we are members.

You will note there have been several changes made in the proposed rules since they were submitted to the State Board of Health of your State, and we would therefore request they all be submitted again for approval, and, that the proposed changes may be better understood, we inclose you that part of the record of our proceedings which gives the full report of the committee.

There is seemingly but one sentiment among health officers as well as railroad men: that the interests of the public health demand uniformity in the matter of transporting the bodies of the dead; yet this is not an easy thing to accomplish unless each state board, and all for that matter, will yield a point in the interests of harmony, and after due consideration of all suggestions offered, we believe the rules now proposed cover all the essential features, and embody the sentiments of a larger proportion of those with whom we have corresponded, and harmonize the conflicting opinions as nearly as it is possible until the several state boards of health can get nearer together, and public sentiment demands some standard of authority by which undertakers are examined as to their competency in the matter of preparing dead bodies for shipment.

In the meantime we think it advisable to make the start in this territory, believing we will soon be working under uniform rules throughout the United

States and Canada. It is desirable, however, to accomplish this with as little friction as possible, and we would therefore suggest they go into effect about September 1st of this year. Will this meet the approval of your Board? We suggest this date as it will give ample time to give notice in the larger towns and cities and to all undertakers.

Will you kindly lay this matter before the State Board of Health for approval, and will you advise Mr. J. E. Quick, secretary, Detroit, Michigan, of the result of your deliberations as soon as convenient? We would add that similar letters are being sent to the several state boards of health.

W. R. BRACKETT,
General Business Agent, Boston & Lowell Railroad.
J. M. JONES,
General Business Agent, Concord Railroad.
F. H. KINGSBURY,
General Business Agent, Cheshire Railroad.

Subsequent to the receipt of the above letter, the following communication was received from the secretary of the National Association of General Baggage Agents:

DETROIT, MICH., Nov. 25, 1889.

I. A. Watson, Secretary State Board of Health, Concord, N. H.:

DEAR SIR, — Yours of the 22d at hand, relating to rules regarding the transportation of dead bodies. I would state that it is the intention of the Association to have said rules put into effect January 1, so far as practicable, and a great many lines are getting out their instructions now regarding them, so that all will be prepared by that time. The Ohio state board has already issued a public circular that the rules are in effect, and for local boards to enforce them, which should be done in all States. In this State the board has issued a public indorsement, which is printed in the public rules as issued by the railroads.

I expect it will take some time to get these fully working throughout the United States, but it is only a question of time when they will be.

Yours,

J. E. QUICK,
Secretary.

It will be seen by the foregoing letter that it is the intention of the transportation companies to have these rules take effect about the 1st of January, 1890. In the meantime it is probable that suitable transportation permits will be prepared, in order that there may be no friction or misunderstanding in carrying out the regulations.

It may be remarked that many of the States have already adopted these resolutions, and the secretary of this Board has notified the secretary of the National Association of General Baggage Agents that New Hampshire will heartily co-operate in the needed reform. The following are the

RULES FOR TRANSPORTATION OF DEAD BODIES.

RULE 1. The transportation of bodies of persons dead of small-pox, Asiatic cholera, leprosy, typhus fever, or yellow fever, is absolutely forbidden.

RULE 2. The bodies of those who have died of diphtheria, anthrax, scarlet fever, puerperal fever, erysipelas, measles, and other contagious, infectious, or communicable diseases must be wrapped in a sheet thoroughly saturated with a strong solution of bi-chloride of mercury, in the proportion of one ounce of bi-chloride of mercury to a gallon of water, and encased in an air-tight zinc, tin, copper, or lead lined coffin, or in an air-tight iron casket, hermetically sealed, and all inclosed in a strong, tight, wooden box; or the body must be prepared for shipment by being wrapped in a sheet and disinfected by a solution of bi-chloride of mercury as above, and placed in a strong coffin or casket, and said coffin or casket encased in a hermetically sealed (soldered) zinc, copper, or tin case, and all inclosed in a strong outside wooden box of material not less than one inch and a half thick.

RULE 3. In cases of contagious, infectious, or communicable diseases, the body must not be accompanied by persons who, or articles which, have been exposed to the infection of the disease. And in addition to permit from board of health or proper health authority, agents will require an affidavit from the shipping undertaker, stating how body has been prepared, and kind of coffin or casket used, which must be in conformity with rule 2.

RULE 4. The bodies dead of diseases not contagious, infectious, or communicable, may be received for transportation to local points in same State when encased in a sound coffin or metallic case, and enclosed in a strong wooden box, securely fastened so it may be safely handled. But when it is proposed to transport them out of the State to an interstate point (unless the time required for transportation from the initial point to destination does not exceed eighteen hours), they must be encased in an air-tight zinc, tin, copper, or lead lined coffin, or an air-tight iron casket, or a strong coffin or casket encased in a hermetically sealed (soldered) zinc, copper, or tin case, and all inclosed in a strong outside wooden box of material not less than one inch thick. In all cases the outside box must be provided with four iron chest handles.

RULE 5. Every dead body must be accompanied by a person in charge, who must be provided with a ticket, and also present a full first-class ticket marked "corpse," and a transit permit from board of health, or proper health authority, giving permission for the removal, and showing name of deceased, age, place of death, cause of death, and (if of a contagious or infectious nature) the point to which it is to be shipped, medical attendant, and name of undertaker.

RULE 6. The transit permit must be made with a stub to be retained by the person issuing it; the original permit must accompany the body to destination, and two coupons, the first coupon to be detached by agent at initial point and sent to the general baggage agent, and the second coupon by the last train baggageman. The stub permit and coupons must be numbered so the one will refer to the other, and on back of permit will be a space for undertaker's affidavit, to be used in cases of contagious or infectious diseases as required by rules 2 and 3.

RULE 7. The box containing corpse must be plainly marked with paster, showing name of deceased, place of death, cause of death, the point to which it is to be shipped, number of transit permit issued in connection, and name of person in charge of the remains. There must also be blank spaces at bottom of paster for station agent at initial point, to fill in the form and number of passage ticket, where from, where to, and route to destination of such ticket.

RULE 8. It is intended that no dead body shall be moved which may be the means of spreading disease; therefore, all disinterred bodies, dead from any disease or cause, will be treated as infectious and dangerous to public health, and will not be accepted for transportation unless said removal has been approved by the State Board of Health, and the consent of the health authority of the locality to which the corpse is consigned has first been obtained, and the disinterred remains inclosed in a hermetically sealed (soldered) zinc, tin, or copper lined coffinor box, or a box encased in a hermetically sealed (soldered) zinc, tin, or copper case.

WATER AND WATER ANALYSIS IN RELATION TO DISEASE.

BY PROF. E. R. ANGELL, DERRY, N. H.

There is a fatal precision in the combination of the elements. They unite according to fixed affinities and in definite quantities, with mathematical exactness. The same results always follow the same causes, and their permanency seems eternal, except other elements of greater affinity present themselves. Then a change occurs. Properties and identity are lost. Different ones appear. New existences are evolved out of old ones. Material is not lost ; but compounds and form and properties are changed.

Introduce a principle which arranges the mineral into forms agreeable to its own nature, and has the power to propagate itself, which for a time continues to increase its structure by the

addition of more mineral, put together by subtle affinities, and then, as if tired of its achievement, allows the building to resolve itself back into primal substances. This principle is called life. It varies from insensible existences to those endowed with the highest sensibility, and the dissolution of its manifestation is as certain as its organization. Perhaps this is the greatest characteristic of life, and its most marked difference from the mineral, that it manifests itself for a nearly definite length of time and then goes out. Thus each different kind of animal or plant has its average length of life. If the animal dies before this age is reached, there is some cause for it, as definite and as fixed as a chemical reaction. Certainly life of its own accord has no desire to depart before its allotted time; but if the organization with which it is concerned is destroyed, it is driven from the citadel. Minerals have a beginning and ending of existence. Life also has both, but liability to disease is added.

What is disease? Life, existing in connection with the mineral and manifesting itself through it, maintains a struggle for existence with the elements. If the powers of the mineral can be controlled, health and life continue; if they cannot be controlled, disorganization and death ensue. Just as when elements of greater affinity present themselves, there is a change in the purely mineral compound; so in the organic, the presentation of greater affinities induces change and the mineral passes from the control of life. Add to this contest another, that life preys upon life, and the conditions favorable to any individual life are greatly diminished.

Disease, then, on the one hand, is hardly more than a chemical reaction unfavorable to the organization of the body within which it occurs; and on the other, hardly more than the overwhelming ravages of parasites or the irresistible attack of beasts. The action of poison illustrates the first; typhoid fever is a type of the second. The antidote to poisons is a medicine; the medicine for zymotic diseases is a germicide.

Where do poisons have their effect mostly? In the blood. The life is in the blood. Introduce a poison into that fluid; its constituents are decomposed. Solution always facilitates chemical reaction. The vital force also attains its ends through the solubility of the substances which it appropriates. Tons of poison

may be about us and come in contact with us; if it does not enter the blood it is harmless.

The universal solvent is water. No fluid penetrates the system more readily than water; consequently there is no more ready vehicle for poisons than water. No fluid constitutes so large a part of the whole organization as water; consequently nothing else furnishes means for so general attack on all sides and in every part.

But what is poison? According to the view of disease presented above, it is anything devoid of vitality which, acting through its affinities, destroys, or tends to destroy, any specific kind of life. It seems to be almost an aphorism, that as life begets life, so death begets death. Putrefying substances generate poisons. Some of them have been learned; many of them are unknown. The virulency of poisons depends quite as much upon how they are administered as upon their quantity or intrinsic energy.

It is apparent that, theoretically, decaying organic matter in drinking-water not only poisons it, but commands the most efficient avenue to poison the drinker. The practical side of the question will be illustrated farther on. Disease germs find no more ready means of access to the system than through water. Forms of life, devoid of much power of locomotion, depend upon outside influences for conveyance; for them air and water are the universal highways. By currents of these they are carried for miles, or placed at once where temperature and nourishment are suitable for them. By these means the parasitic microbes or pathogenic germs enter the system, and the patient becomes not unlike a tree attacked by army worms.

We have thus passed, though imperfectly, from inanimate matter to its organization into dwellings for sensitive creatures, in order, if possible, that a more tangible, if not a more accurate knowledge may be had of how impure water may work its effect upon the system. Together with this, and with what may be presented farther on, we hope to emphasize the truth that the provision and preparation of water suitable for drinking purposes should be a task to concern us no less than the preparation of our food.

TYPHOID FEVER.

The following cases illustrate the kind of water which is productive of typhoid fever:

PARTIAL ANALYSIS OF WATER FOR H. C. ROWELL, BERLIN FALLS, N. H., NOVEMBER 8, 1888.

Odor, some foul; color, marked yellowish tint; evaporation, little foamy; residue, yellowish and some patches; residue darkens strongly on ignition; chlorine, .9; free ammonia, .62; albuminoid ammonia, .176; nitric acid, some; little nitrous acid; little sediment; large, active infusoria; fungi with spores; some bacteria.

Opinion: This water is badly polluted.

The following information was subsequently obtained from Mr. Rowell:

"No. 2 is spring water . . . This spring supplies a number of families, and among them there have been a number of cases of typhoid fever lately. No. 3 is well water . . . There have been as many as eight cases of fever among the families who use this water."

The analysis of sample No. 3 is as follows: Odor, some foul; color, marked yellow; evaporation, some foamy; residue, yellowish, some patches; residue blackens intensely on ignition; chlorine, .9; free ammonia, .416; albuminoid ammonia, .212; some nitric acid; some nitrous acid; sediment, very little; some bacteria.

Opinion: This water is badly polluted.

SANITARY ANALYSIS OF WATER FOR J. FRANKLIN ROBINSON, M. D., MANCHESTER, N. H., DECEMBER 10, 1888.

Odorless; color, brownish; evaporation, quiet; residue, uniform but yellowish; residue blackens strongly on ignition; total solids, 4.5 grains; loss on ignition, 1.2; hardness, 2 degrees; alkalinity, 2 degrees; chlorine, .3; free ammonia, .09; albuminoid ammonia, .128; considerable nitric acid; no nitrous acid; too much sediment; bacteria.

Opinion: This water is polluted.

Dr. Robinson gives the history of the case in the following letter:

MANCHESTER, N. H., Sept. 28, 1889.

PROF. ANGELL:

Dear Sir,— Please pardon my long delay in answering your letter. I will now endeavor to give you an account of the Hodgman typhoid cases and will

inclose a rough sketch of the relative positions of the buildings on his farm in Bedford. The house is on a hill on the north side of the road, six and a half miles from Manchester and about one half a mile west from the Nashua road. It is built of brick, is small, and has an L and shed of wood. The pump is in the L part and communicates with the well by a lead pipe. The barn is across the road and is quite large. A ledge comes to the surface of the road and slopes toward the barn.

The well is placed within eighteen feet of the barn and close to the road. The ground slopes from the barn to the well and toward a brook which is a few feet from the well, and which receives the drainage partly from the direction of the barn and partly from the opposite hillside. The barn cellar was very wet and filthy; several hogs wallowed about in the mire, which kept it in a semi-fluid state. The season had been *very* wet and the water stood in pools on all the low lands; everything was drenched.

The well had been in use for seventy-five years, according to the statement of one of the relatives, and I understood that it had never been cleaned out, but am not certain about that. Mr. Hodgman had been feeling unwell the most of the summer, got easily heated, and, according to his own statement and that of his family, he drank large quantities of well water. On the 6th of October, 1888, I was called to see him. Found him with a temperature of 103 4-5° Fahrenheit, pulse of 88, abdomen tympanitic. A few rose spots were present and he had the characteristic typhoid stools.

On October 14 he had a temperature of 105 3-5° Fahrenheit. After this his temperature gradually fell until Nov. 4, when it reached 99 3-5° Fahrenheit.

From October 30 to November 5 he improved rapidly; his tongue cleared up, the tympanites and tenderness of the bowels disappeared, his appetite was ravenous and he begged for solid food, which was not given him. His temperature on November 8 rose to 103 1-5° Fahrenheit, but fell the next day to 101 1-5° Fahrenheit, and on the 11th to 100 3-5° Fahrenheit. His pulse all this time was high, ranging from 116 to 136. On November 17 his temperature after rising to 102 3-5° Fahrenheit on November 13 had gradually dropped to 101 4-5° Fahrenheit, but it fell rapidly in the next two days and on November 19 was normal. It continued normal or subnormal until December 2, when it began to rise, being on December 3, 101 4-5° Fahrenheit; on the 4th, 103° Fahrenheit; on the 5th, 104 2-5° Fahrenheit; on the 6th he died.

During the period that his temperature was at normal or below, his pulse ranged from 116 to 132 and he was very delirious. He took large quantities of milk every day of his sickness, but he sank from nervous exhaustion, his death occurring on the sixty-eighth day of his illness. He was thoroughly saturated with the typhoid poison when he was first taken ill, for his seizure was violent, and the poison continued to enter his system through the well water which he drank.

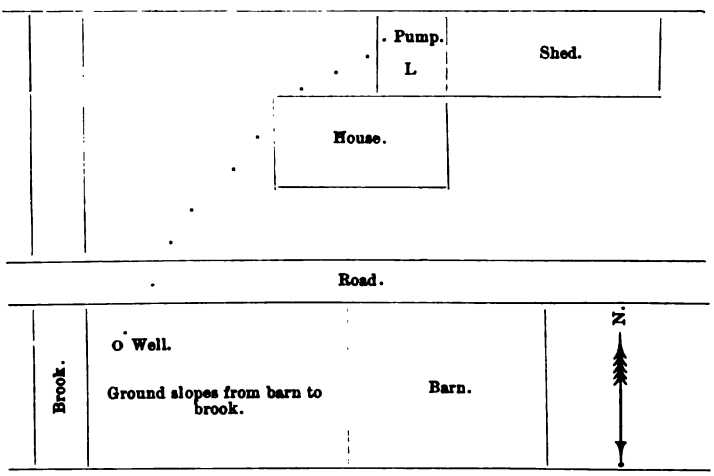
On the first day that I saw him I examined the premises and told his brothers that the well water was undoubtedly the cause and that all the water from the well should be boiled before using, but that it would be better to obtain their

drinking-water from some other well. They scouted the idea and refused to comply with my requests, and continued to use the water from this well without boiling and to give it to the patient in spite of my commands. The result was melancholy but sure. The husband died, his wife and two children and one of his brothers all came down with the fever; these latter cases all recovered.

It was during the latter part of the husband's sickness that I sent a sample of the well water to you, and the result of the analysis confirmed my statements. If there are any facts connected with the case which I have not mentioned and which you may wish to know, I shall be most happy to render them.

Very truly yours,

J. FRANKLIN ROBINSON.



SANITARY ANALYSIS OF WATER FOR IRVING DOW, NORTHWOOD NARROWS, N. H., AUGUST 29, 1889.

Odor, some; color, slightly yellowish; evaporation, quiet; residue, uniform but yellowish; residue scarcely changes color on ignition; total solids, 4.4 grains; loss on ignition, 1.2; hardness, 2.3 degrees; alkalinity, 2 degrees; chlorine, .2; free ammonia, .398; albuminoid ammonia, .084; mere trace of nitric acid; no nitrous acid; iron, strong trace; some zinc; sediment; enormous quantity of ferric oxide.

Opinion: This water is polluted with vegetable matter.

The following information was given by Mr. Dow:

The well was dug about one year ago. It is at the foot of a hill near a brook, so that most of the year it is covered with water. The well was bricked up air tight, so if any brook water entered it must enter through the bricks. Water which comes from the hill enters the well at the bottom. A windmill forces

the water into a tank in the stable, from which it is drawn for use. The drainage of the house is far removed from the well. The water was good during the winter, but in the spring it developed a very offensive odor and became so rusty that it could not be used for washing clothing. The water was not used for drinking purposes since last May until recenly; then it was used only two days. A case of typhoid fever occurred in the family.

SANITARY ANALYSIS OF WATER FOR FREDERICK CHANDLER, M. D., MONT VERNON, SEPTEMBER 9, 1889.

Odor, some; color, little milky or turbid; evaporation, foamy; residue, little yellowish and circles; ignition of residue, it blackens; total solids, 3.6 grains; loss on ignition, 1.2; hardness, 1.5 degrees; alkalinity, 1 degree; chlorine, .3; free ammonia, a trace only; albuminoid ammonia, .218; nitric acid, mere trace; nitrous acid, none; strong trace of iron; sediment, little; vegetable cells; bacteria; fungi; spores; oxygen for oxidation, .4368.

Opinion: This water contains sufficient vegetable matter to condemn it.

Dr. Chandler furnished the following information:

Distance of the well from any building, 170 feet; depth, 12 feet; average depth of water, 6 feet. It is located in a mowing field which is flat, or nearly so. The soil is a rich, muddy loam, and has been manured from time to time. The grade of the curb of the well is but a few inches above its surroundings. The young man who died of typhoid fever had lived in the family using the water only about four weeks before he was taken sick. His general health had not been the best, and his system seemed ripe for the reception of the typhoid germ. Dr. Chandler carefully searched for the cause of this case, and could find it nowhere unless it was in the water. The analysis confirmed his suspicion.

PARTIAL ANALYSIS OF WATER FOR G. H. INGALLS, M. D., BELMONT, N. H., SEPTEMBER 18, 1889.

Odor, musty; color, slight; evaporation, quiet; residue, uniform and gray; residue darkens some on ignition; chlorine, 16.8; free ammonia, .01; albuminoid ammonia, .124; nitric acid, 23.1; nitrous acid, considerable; iron, strong trace; sediment, little; bacteria; infusoria; fungi; spores; oxygen for oxidation, .036.

Opinion: This water is badly polluted, and wholly unfit for drinking purposes.

The following communication was received from Dr. Ingalls:

BELMONT, N. H., Sept. 21, 1889.

Prof. Angell:

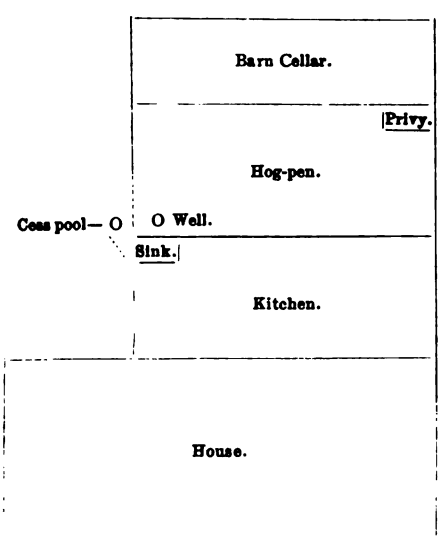
DEAR SIR,— I send you to-day a brief history of the well and surroundings of buildings where I have a case of typhoid fever, as you know, resulting from

drinking impure water. If it will do any good to the public, I am only too glad to report such cases, for I am a firm believer that too much of our sickness results from pure carelessness in drainage and not regarding the sanitary conditions of our homes, especially the farms.

For the past year we have had several severe cases of typhoid fever and diphtheria, and most of them have been found on the grand old farms, and were directly traceable to foul sink-drains and polluted drinking-water. The facts in this case (which is a fair sample of many others) are as follows: The farm is one of the oldest in town. Here have lived several families, but for the last twenty-five years more or less sickness has resulted, especially in the last ten years. And no wonder, for, as the outline will show, distance from sink to well, 4 feet; the dotted lines represent a lead pipe from sink to cesspool, which is only 5 feet from well; the hogpen, with privy emptying into it, is 16 feet from well; and when we remember that well, cesspool, hog-pen, and privy were all under one floor, for in this case there seemed to be a desire to get everything as near the bottom of the well as possible, and all within an area of at least 30 feet, we do not wonder what caused so much sickness; and the only thing that prevented a severe outbreak here was that the bright young farmer who has just purchased this place saw the danger, and had already commenced extensive repairs, but, as the analysis of the water proved, it was too late to prevent his family from succumbing to typhoid fever.

Respectfully yours,

G. H. INGALLS.



The following cases illustrate the kind of water which may cause diphtheria:

SANITARY ANALYSIS OF WATER FOR C. H. HOLCOMB, M. D., BROOKLINE, N. H., APRIL 5, 1888.

Odorless; color, yellowish tint; evaporation, quiet; residue, uniform and brownish; total solids, 25.7 grains; loss on ignition, 2.7; residue blackens intensely on ignition; hardness, 5.5 degrees; alkalinity, 2.5 degrees; chlorine, 4.9; free ammonia, .08; albuminoid ammonia, .19; much nitric acid; trace of nitrous acid; sediment, little; few infusoria and bacteria.

Opinion: This water is badly polluted, and wholly unfit for drinking purposes.

There was a case of diphtheria in the family using this water. This clipping was taken from the "Boston Herald":

"Terrible ravages of diphtheria in a New Hampshire family. Peterborough N. H., June 24, 1889. O. J. Nutting, aged 38, pail manufacturer, died to-day of diphtheria. One of his children died of the same disease May 19; two others, June 16, and a fourth one, June 17. The widow alone survives."

The following is the analysis of the water which this family used:

REPORT DATED JUNE 25, 1889.

Odorless; color, slightly yellowish; evaporation, quiet; residue, uniform and white; residue changes color slightly on ignition; reaction, alkaline; chlorine, .8; free ammonia, .252; albuminoid ammonia, .04; much nitric acid; no nitrous acid; sediment, little; tissue of some kind; bacteria; decomposing matter.

Opinion: This water is polluted. It should not be used for domestic purposes.

SANITARY ANALYSIS OF WATER FOR J. H. BROWN, HEALTH OFFICER, EXETER, N. H., APRIL 27, 1889.

Odorless; color, little yellowish; evaporation, quiet; residue, yellowish, but uniform; residue darkens but little on ignition; total solids, 15.9; loss on ignition, 7.4; hardness, 4.7 degrees; alkalinity, 1; chlorine, 2.4; free ammonia, .133; albuminoid ammonia, .034; nitric acid, 1.68; trace of nitrous acid; sediment, extremely slight; microscopic examination shows nothing important; oxygen for oxidation, .007; zinc, trace; iron, trace.

Opinion: This is bad water. It is probably contaminated by vault or drain.

Mr. Brown gave this information:

The well is located in the cellar of the L of the house. It is raised about a

foot above the surface of the cellar. The water is drawn through iron pipe. In the woodshed, which is two stories high and a part of the house, is located a vault large enough for two families; it is made of brick, cemented on the inside when built, but it has scaled off badly. When it rains, the water from the building runs into it at the top, which makes a very bad place. At the time of the diphtheria the vault had not been emptied for two years, and was full to overflowing; a horrid smell penetrated the whole house. The vault was by actual measurement 20 feet 6 inches from the well. The sink water was carried to the public sewer about one year ago. Both families had recently moved into the house. The family that had the diphtheria had been in the house about five months, the other about two months. There were two cases of diphtheria, one fatal. The attending physician said the case was the worst he ever saw survived.

LEAD POISONING.

SANITARY ANALYSIS OF WATER FOR W. W. PILLSBURY, M. D., MERRIMACK, N. H., SAMPLE "WHEELER WELL," JANUARY 14, 1889.

Odorless; colorless; evaporation, quiet; residue, uniform and gray; ignition of residue, it darkens some; total solids, 14.3; loss on ignition, 2.6; hardness 3.5; alkalinity, 2.5 degrees; chlorine, .2; free ammonia, .025; albuminoid ammonia, .09; some nitric acid; no nitrous acid; lead, .04 grain per gallon; sediment, slight.

Opinion: This water contains fully enough lead; the amount of albuminoid ammonia is almost as high as allowable for well water.

SAMPLE "WILSON WELL."

Odorless; colorless; evaporation, quiet; residue, uniform and grayish; residue darkens some on ignition; total solids, 5.2; loss on ignition, 9; hardness, 3 degrees; alkalinity, 3 degrees; chlorine, .4; free ammonia, .022; albuminoid ammonia, .054; little nitric acid; no nitrous acid; lead, .12 grain per gallon; sediment, little.

Opinion: Remove the lead, and this is excellent water. The lead is in large excess.

Dr. Pillsbury subsequently furnished the following information:

In the Wheeler water organic matter was suspected, and possibly lead; but no strong symptoms of lead poison occurred in the family.

In the Wilson family, three out of six were suffering from what was supposed to be lead poisoning. The water is brought to the house through a lead pipe

from a spring 20 rods distant. The use of the water was discontinued, and the patients improved.

Another sample of water analyzed for Dr. Pillsbury, June 28, 1889, contained .084 grain of lead per gallon. The family suffered from lead poisoning. Frequently a water which contains considerable organic matter acts upon lead more freely, because the excess of carbonic acid arising from decaying substances dissolves the coating of carbonate formed upon the metal. The water in the following example may have received its poisonous quantity of lead from this cause :

PARTIAL ANALYSIS OF WATER FOR G. H. LARABEE, M. D., SUNCOOK, N. H., FEBRUARY 21, 1889.

Odor like that of a drain; color, blackish brown and turbid; evaporation, quiet; residue, uniform but brown, and blackens quite strongly on ignition; chlorine, .4; free ammonia, .11; albuminoid ammonia, .104; some nitric acid; no nitrous acid; lead, .086 grain per gallon; iron, .78 grain; sediment, some; bacteria; scales of epithelium and spores of fungi.

Opinion: This water is not fit for drinking purposes, on account of the lead it contains. The amount of iron also condemns it. It is contaminated also with organic matter.

Dr. Larabee gave this information :

A man about fifty years old had been sick, but not confined to the house, all winter, with a bronchial trouble. After moving into the house supplied with this water, he was taken with severe pain across the lumbar region and stomach, also bowels. He was unable to retain anything on his stomach, and died after occupying the place about one week.

Diseases of a peculiar nature, resembling lead poisoning, are caused by drinking impure water. The following will serve to illustrate them :

PARTIAL ANALYSIS OF WATER FOR N. F. CHEEVER, M. D., GREENFIELD, N. H., JANUARY 26, 1889.

Odorless; color, milky and turbid; evaporation, very foamy; residue, yellowish and full of small patches; it blackens strongly on ignition; chlorine, 1.3; free ammonia, .026; albuminoid ammonia, .352; considerable nitric acid; much nitrous acid; lead, a trace; sediment, some; cyclops quadricornis fungi; bacteria.

Opinion: This water is badly polluted, and wholly unfit for drinking and cooking purposes.

The following letter gives the history of the case:

GREENFIELD, N. H., Feb. 11, 1889.

DEAR SIR, — The case of George Burnham is as follows: In the summer of '84 he came to me with partial paralysis of one arm, complaining of numbness and loss of power in it. I treated him several weeks, and then he recovered. The next time I knew of him he had an attack in the summer of '85 much like bilious colic, which lasted a week or more. I had no occasion to treat him again till this winter. He has been poorly ever since fall; loss of appetite and vomiting were the symptoms. I was not called to treat him till the first day of January, when I found these symptoms: Great pain, not confined to any one locality, but centering mostly in the back over kidneys, in right side over liver, and over stomach; the pain tearing in character, nearly constant, and could only be controlled by hypodermic injections of ¼ to ⅜ grain morphine three or four times in twenty-four hours; loss of appetite, with spitting up of food; tenderness over liver, elicited by deep pressure over gall bladder; tongue moist and slimy, the teeth making furrows along it when protruded; temperature normal; pulse 70, full and strong; face, haggard and anxious. These symptoms had gradually developed. I suspected the case to be one of lead poisoning. . . . . Meanwhile the symptoms continued without much change till the 20th, when the pain subsided and the tongue improved for about a week, when the pain came on again, and the tongue resumed its former appearance. (I forgot to say that the tongue, when he was at the worst, was distinctly black over nearly the entire surface.) The relapse lasted seven or eight days, since which he has been gaining in every particular. The examination of his urine showed it highly acid with sp. gr. 1.026, and so crowded with muriates that it was impossible to make out anything else. A second examination about a week ago gave the same results.

Dr. Prescott, of Nashua, saw the case with me at that time, and our diagnosis was blood poisoning from use of impure water. Anything bearing upon the case you might be able to suggest, would be thankfully received.

Yours very truly,

N. F. CHEEVER, M. D.

SANITARY ANALYSIS OF WATER FOR M. F. SMITH, M. D., HAMPTON, N. H., JULY 8, 1889.

Odor, little; color, slight yellowish tint; evaporation, quiet; residue, uniform and nearly white; it blackens some on ignition; total solids, 6.7; loss on ignition, 1.5; hardness, 3.5 degrees; alkalinity, 1.0; chlorine, .9; free ammonia, .368; albuminoid ammonia, .052; nitric acid, much; little nitrous acid; lead trace, about .01 grain per gallon; iron, .05; sediment, too much; infusoria; bacteria.

Opinion: This water is polluted by vault or drain. Excess of free ammonia indicates urea.

Dr. Smith gave the following information :

The patient drinking the water had symptoms of lead poisoning but not well marked ; and with these, symptoms of some form of rheumatism, which would yield to treatment for a time, and then return again, and so on. The family commenced using this water about four years ago, and for the last three years have had more or less trouble as mentioned above. The horse they had when they moved upon the place seemed to be sound ; in about one year it became lame in the fore legs, weak in the knees. They sold him, and in a short time he recovered from the trouble and seemed all right. They now have a young horse that is in just the same condition. The gentleman says : "The horse seems to appear with his fore legs as my legs feel."

The well is in the cellar, and lead pipe connects it with the house and the stable.

PARTIAL ANALYSIS OF WATER FOR J. O. DUTRIZAC, M. D., LACONIA, AUGUST 19, 1889.

Odorless ; colorless ; evaporation, quiet ; residue, uniform and white ; residue darkens little on ignition ; chlorine, 3.6 ; free ammonia, .192 ; albuminoid ammonia, .078 ; nitric acid, 7.28 ; nitrous acid, trace ; sediment, some ; no lead ; infusoria and disintegrated matter.

Opinion : This is polluted water.

Dr. Dutrizac furnished this information :

The family using this water live on high land. The houses in the neighborhood are not very close together, perhaps 150 feet apart. The well is on a level with the house, about 70 feet from the privy and 50 feet from sink drain Every member of the family has been feeling unwell for a year or two. Two years ago they were very sick, and attributed their sickness to lead poisoning from lead pipe in the water ; but to-day there is no lead pipe in the water. I think their sickness was caused by the water alone. Their symptoms are frequent headache, chills, pain in all their limbs, no appetite, no energy, and general weakness.

PARTIAL ANALYSIS OF WATER FOR F. W. JONES, M. D., NEW IPSWICH, N. H., MARCH 7, 1887.

Odor, slightly foul ; color, milky and turbid ; residue on ignition emits an unpleasant odor, and blackens much ; chlorine, 1 ; free ammonia, .016 ; albuminoid ammonia, .31 ; nitric acid, in excess ; no nitrous acid ; iron, .1 ; sediment, too much ; water swarms with bacteria ; infusoria ; scolecida ; cyclops quadricornis ; no lead.

Opinion : This water is horribly polluted.

The location and history are as follows :

The well is situated on the side of a hill. The nearest privy is 15 feet distant ; another is 100 feet distant. The vaults are not cemented. Sink drain

discharges upon the ground 100 feet away. Water is conveyed in lead pipe about 200 feet long. The family consists of four persons; they are more or less ill all the time; they suffer with headache and sore throat, diphtheria in one case, rheumatism, skin diseases, irregularity of bowels in every case; more or less general debility in all the cases. The kidneys and bladder have been more or less affected in every member of the family, which was first noticed about two years ago in the oldest member. The children and mother were away from home several weeks during the past summer, and the health of all improved; but the former symptoms returned after they had been at home a short time.

It is, certainly, impossible to tell how small a quantity of lead might affect some constitutions, especially under certain conditions of vitality. Without doubt, a person weakened by drinking organically impure water is more readily affected by a small quantity of lead. But it seems from the cases described that there may be great liability to confusion between the effects of water polluted with organic matter and lead poisoning. It may be that in some instances where but a trace of lead, or none, was found on analysis, that the patients were, nevertheless, lead poisoned. They may have drunk water which had remained for some time in the pipe. Frequently such water contains much lead, when water taken directly from the well contains none.

A very singular and interesting case of blood poisoning from use of polluted water occurred recently in the practice of Dr. M. T. Stone, Troy, N. H. The results of the analysis of the water are as follows:

Odor, not marked; color, little yellowish and turbid; evaporation, little foamy; residue, little yellowish and few circles; it blackens on ignition; chlorine, .4; free ammonia, .005; albuminoid ammonia, .242; nitric acid, .208; no nitrous acid; no lead; little sediment; bacteria; infusoria; tissue; cells; suspicious looking matter.

Opinion: This water is badly polluted and wholly unfit for drinking purposes.

Dr. Stone gave the following history of the case:

Elrose B., aged five years, had been in good health until I was called to see him, when I found him slightly indisposed from what I thought to be indigestion and I prescribed accordingly, expecting he would be all right in a few days, but instead he seemed to be getting worse, with the following symptoms: loss of appetite, complaint of bad feeling in the head or headache all the time, nausea but no vomiting, constipation with clay-colored stools and very irritable, no elevation of temperature, and pulse about 100. These symptoms continued for some time, when he began to have profuse perspiration, with the hands, arms,

feet, and legs cold and clammy, with the irritability increased, and loss of sleep and restlessness.

At this time there appeared an eruption around the finger-nails, less around the toe-nails, of watery blisters, and soon upon the body, mostly upon the back, a vesicular or papular eruption, quite profuse, which soon spread to the legs and feet, and which added to the irritability on account of the itching which accompanied it. This eruption I decided must be a form of erythema multiforme. Soon there appeared upon the ends of the fingers and toes and palms of the hands white patches the size of a split pea and larger, which looked to be filled with matter, but on opening none would be found; they were dead skin, which gradually peeled off. During this time, the bowels remained constipated and there was no elevation of temperature, or but slight, and not continuous, neither was it below normal; still complained of nausea, but had no vomiting, the great cause of discomfort being the itching. The pulse had gradually increased in frequency until it was 160 per minute. The patient was still dressed and was about the house, being up and down.

Counsel was called, and it was the opinion that the patient was suffering from intestinal indigestion, and he was put upon a liberal course of easily assimilated nourishment. He had a slight fever at this time which lasted about a week, the temperature rising only a degree or a degree and a half, during which time the eruption disappeared, the pulse went down to 135, bowels moved freely but no diarrhea, the hands and feet regained their natural warmth, and there was a desire for food. There was a gradual improvement in all the symptoms but the irritability and restlessness. The symptoms indicated that something was causing a debilitated condition of the blood, or blood-poisoning, but the water supply as its source had not been given thought enough to cause particular inquiry, because we expected to find some form of fever or diarrheal disorder as a manifestation, but here we had no diarrhea, but constipation; no fever, neither did the temperature go below normal; no vomiting, but great irritability, and an erythematous eruption.

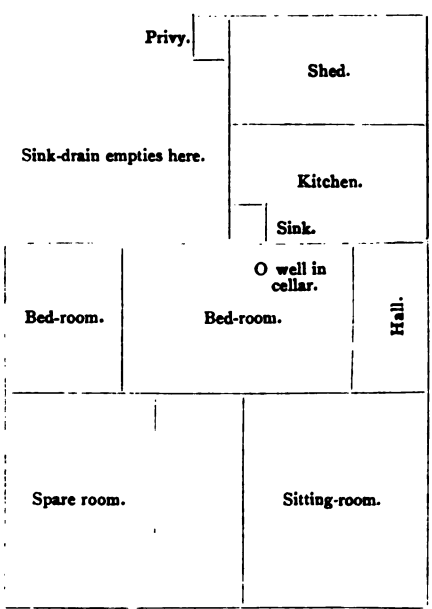
The improvement continued for a week, when the old symptoms returned, greatly aggravated. The hands and feet again became cold and clammy, and the body covered with a profuse perspiration; the eruption appeared more profuse than before and this time upon the neck and face, and the pulse 160 to 170 per minute.

No cause having been found, I thought it must be the water, and on inquiry learned that the well was in the cellar, and that the privy was formerly less than twenty feet distant, that it was moved last spring, and that the sink-drain emptied on to the ground some eight or ten feet from the house, and gave orders to have the water from the well excluded from everything given the patient, and sent a sample for analysis, which showed the water to be polluted and unfit for use. Then the cause for the relapse became evident. While he was taking the large quantities of liquid nourishment, he received the water but little and that diluted, and the poison had been somewhat eliminated, and hence the improvement; during the week of improvement, he drank more water and therefore

received a new dose of poison. At the present time the symptoms are abating and he bids fair to recover. The illness at the present time has extended over a period of nearly three months. A sister of the patient next younger had whooping-cough quite severely in the winter, and during the spring and summer has had a cough, and persistent and frequent attacks of vomiting, which were supposed to be after effects of the whooping-cough, but I now believe them to have been caused by the polluted water, for within a few days she has commenced to have an eruption on the hands, arms, and body. One or two other members of the family have had slight diarrhea during the summer.

I have been in practice here ten years, and this house has been occupied by different families all the time, and I don't recall ever having any case of serious illness there before. This family, consisting of father, mother, and five children, have lived there three years and have had more or less slight ailments. The family remarked that never before had they known the water to be in the cellar as much as this year, as the well had overflowed and covered the cellar bottom several times. No doubt the large amount of rainfall during the season had caused a larger amount of the decaying matter from the surface to be carried into the cellar, besides leaching the ground more thoroughly.

The following diagram will illustrate the situation:



The slope of the ground was from the privy towards the house.

TROY, N. H., September 23, 1889.

The cases following illustrate some of the various kinds of disease which bad waters may cause or help to cause.

PARTIAL ANALYSIS OF WATER FOR G. F. ABBOTT, TILTON, N. H., APRIL 9, 1887.

Some odor; milky and turbid color; residue blackens very much on ignition; acid reaction; chlorine, 2.2; free ammonia, .1; albuminoid ammonia, 1.12; no nitric acid; no nitrous acid; very large amount of sediment; water full of bacteria.

Opinion: This water is very badly polluted.

The location and history are as follows:

The well is situated in basement of house, 10 feet from one privy, 25 feet from another, 15 feet from sink-drain, which empties upon the ground. The general health of some of the parties using the water is good; of others poor. Some are troubled with headache and looseness of bowels and nausea.

PARTIAL ANALYSIS OF WATER FOR G. F. ABBOTT, TILTON, N. H., MAY 31, 1887.

Colorless; odor, a little foul; reaction, alkaline; evaporation is foamy; residue, in circles and patches; it blackens on ignition; chlorine, 2; free ammonia, .04; albuminoid ammonia, .146; no nitric acid; no nitrous acid; too much sediment; many bacteria; much disintegrated matter.

Opinion: This water is polluted and unfit for drinking purposes.

The location and history are as follows:

It is a driven well recently made. From sink-drain it is 40 feet; 35 feet from privy. The health of those using the water is good in case of some; poor in case of others. A person was very sick one day after drinking freely of the water the night before; no apparent cause for the sickness.

PARTIAL ANALYSIS OF WATER FOR E. T. HUBBARD, M. D., ROCHESTER, N. H., JUNE 25, 1887.

Odor, little foul; color, slightly milky; evaporation, some foamy; residue blackens on ignition; chlorine, .7; free ammonia, 1.224; albuminoid ammonia, .13; some nitric acid; large quantity of nitrous acid; sediment, too much, white, gelatinous, and flaky, and settles slowly; many bacteria.

Opinion: This water is unfit for drinking and cooking purposes. It is polluted with excrementitious matter. It contains urea.

The location and history are as follows:

The well is situated 25 feet from privy; 20 feet from stable. Most of the parties using the water are suffering with stomach troubles. Boy had acute Bright's disease. No fevers.

PARTIAL ANALYSIS OF WATER FOR C. L. JUDKINS, HOLLIS, N. H., APRIL 25, 1887.

Odor is slightly foul; color is quite milky and turbid; alkaline reaction; residue blackens much on ignition; chlorine, 2.8; free ammonia, .42; albuminoid ammonia, .65; large amount of nitric acid; very large amount of nitrous acid; much sediment; water full of bacteria; much decaying matter.

Opinion: This water is very badly polluted.

The location and history are as follows:

It is a schoolhouse well and is at some distance from privy; no other source of pollution is near. Many of the school children are sick, for which no possible cause can be given.

PARTIAL ANALYSIS OF WATER FOR E. T. HUBBARD, M. D., ROCHESTER, N. H., JUNE 25, 1887.

Odorless; brownish color; evaporation, quiet; residue blackens on ignition; alkaline reaction; chlorine, 2.9; free ammonia, .234; albuminoid ammonia, .1; much nitric and considerable nitrous acid; too much sediment; fungi; rotifers; bacteria; suspicious-looking matter.

Opinion: The water is polluted. The stable and privy are indicated.

The location and history are as follows:

The well is situated in the front yard, 40 feet from sink-drain, 30 feet from privy, and 10 feet from stable. Quite a number of people use the water, and they are troubled more or less with stomach and liver disorders. One is subject to headache after drinking the water.

PARTIAL ANALYSIS OF WATER FOR C. L. JUDKINS, HOLLIS, N. H., APRIL 25, 1887.

Color, slight yellowish tint; odorless; reaction alkaline; residue darkens little on ignition; chlorine, 2.7; free ammonia, .08; albuminoid ammonia, .092; some nitric acid; nitrous acid, none; some sediment; disintegrated matter, and bacteria, which in appearance very closely resemble the micrococcus of pneumonia.

Opinion: This water is polluted, and is dangerous to health.

The location and history are as follows:

Schoolhouse well about 90 feet from privy; the land slopes toward the well. Sickness in the school. Health has always been good until the present time. Pneumonia is the prevailing disease. No cause can be given for so many school children being sick. Few cases outside, but mostly confined to the school.

PARTIAL ANALYSIS OF WATER FOR C. L. JUDKINS, HOLLIS, N. H., APRIL 25, 1887.

Colorless; odorless; reaction, alkaline; residue darkens little on ignition chlorine, 1.2; free ammonia, .15; albuminoid ammonia, .12; little nitric acid; no nitrous acid; sediment, little; infusoria and some decaying matter.

Opinion: This water contains too much organic matter. It is prejudicial to health.

The location and history are as follows:

Town pump. All possible sources of contamination, apparently, are some distance away, but are higher than well, and the land slopes towards it. Sink-drain, privy, and stable are about 200 feet distant. The nearest vaults are not cemented. School children who have drunk this water are sick without known cause.

PARTIAL ANALYSIS OF WATER FOR S. A. EVANS, M. D., CONWAY, N. H., JUNE 10, 1887.

Odor, not marked; color, slightly milky; alkaline reaction; residue blackens on ignition; 3.4 grains of chlorine per gallon; free ammonia per million parts, 1.904; albuminoid ammonia, .6; large amount of nitric acid; little nitrous acid; some sediment; microscopic examination showed bacteria, fungi, and vegetable products from hay or straw.

Opinion: This water is extremely bad. A considerable quantity of urea is present.

The location and history are as follows:

The well is situated in the L part of an old farmhouse under the floor, surrounded by various sources of pollution: 30 feet from sink-drain, 25 feet from privy, 30 feet from stable. Somebody sick in the house most of the time, pneumonia, phthisis, quinsy, dysentery, coughs, colds, sore throat, salt rheum, bilious fever, etc. Three deaths in the family the past year —father, of phthisis, two children of complication of obscure diseases.

PARTIAL ANALYSIS OF WATER FOR J. W. STAPLES, M. D., FRANKLIN FALLS, N. H., FEBRUARY 12, 1887.

Odor, disgusting; color, decidedly yellow; residue blackens strongly on ignition; marked alkaline reaction; chlorine, 9.5; free ammonia, 2.38; albuminoid ammonia, .40; considerable nitric acid; much nitrous acid; too much sediment; fungi; infusoria; many bacteria.

Opinion: This water is horribly polluted.

The location and history are as follows:

The well is not sufficiently removed from possible contamination from privy and sink-drain. A most obstinate case of gastritis occurred. The patient was

very much emaciated, and it hardly seemed possible for him to recover. No case of fever seems to have occurred in the family, and they seem to have been quite free from diseases of a zymotic character.

SANITARY ANALYSIS OF WATER FOR B. B. ROLLINS, HEALTH OFFICER, MEREDITH, N. H., DECEMBER 17, 1888.

Slight odor; color, milky and turbid; residue, yellowish and flaky; evaporation, quiet; residue blackens intensely on ignition; total solids, 29; loss on ignition, 4.2; hardness, 7.5; alkalinity, 7; chlorine, 3.9; free ammonia, .024; albuminoid ammonia, .372; large quantity of nitric acid; much nitrous acid; too much sediment; many bacteria.

Opinion: This water is badly polluted.

The location and history are as follows:

The well is under the house, and 8 feet from sink-drain, 40 feet from privy, 20 feet from stable, 40 feet from pig-pen. Land slopes toward the well from the sources of filth. Health of family is miserable. The water affects badly all who use it, causing headache and sore throat. A child has most obstinate constipation, no appetite, no strength, but gains as soon as she goes away from home to see relatives. The man has headache, lips swollen, lips and tongue smart.

PARTIAL ANALYSIS OF WATER FOR J. W. PRAY, M. D., NORTHWOOD, N. H., MARCH 31, 1887.

Odor, slightly foul; color, yellowish; residue blackens on ignition; reaction, alkaline; chlorine, .5; free ammonia, 1.04; albuminoid ammonia, .16; some nitric acid; little nitrous acid; very little sediment; bacteria; few infusoria; woody fiber.

Opinion: This is very bad water. It is contaminated by the stable and privy.

The history and location are as follows:

The well is on slightly higher ground than the house; distant from privy and stable, 25 feet; sink-drain distant 20 feet, but securely conveyed in iron pipe. Daughter subject to colic, wife subject to headache, husband has frequent attacks of erysipelas.

SANITARY ANALYSIS OF WATER FOR DRS. ALLEN AND POWERS, ACWORTH, N. H., AUGUST 22, 1889.

Odorless; color, very slight yellowish tint; evaporation, quiet; residue, uniform and white, and blackens on ignition; total solids, 10; loss on ignition, 1.6; hardness, 4.6 degrees; alkalinity, 4 degrees; chlorine, 1.8; free ammonia, .70; albuminoid ammonia, .12; nitric acid, .42; nitrous acid, trace; lead, none; sediment, little; infusoria; disintegrated matter; oxygen for oxidation, .1072.

Opinion: This water is badly polluted.

Dr. Powers gives the history of the case in the following letter. It is especially interesting from the fact that it illustrates how well water may become polluted when the owner is quite positive that there is no chance for contamination:

ACWORTH, N. H., Sept. 18, 1889.

Edmund R. Angell:

The water sent you was for the reason that two adults in a family of three had slight ailments pointing to bad ingesta of some sort. I examined the water with the nitrate silver test and found it had abundance of chlorides. I told them to stop drinking it. They dug down and found that the frost had broken the sink-pipe, so that it soaked into the ground very near the well wall. They have thought to clean the well, but I told them it would never be safe. The privy vault is over 100 feet away and below the top of the well by some 6 or 8 feet, with a moderate descent that way far below and beyond the vault. The barn offal is below and beyond the privy by another hundred feet, I should think; have been no animals kept there for some years. The well is about 15 feet deep.

G. H. POWERS, M. D.

The following experiments exhibit the results which a good water gives on analysis and those which it gives when polluted with filth from different sources:

UNCONTAMINATED WATER.

[All the figures are parts per 100,000.]

Odorless.	
Colorless.	
Evaporation	Quiet
Residue	Uniform and white
Ignition of residue	It does not darken
Total solids	5.4000
Loss on ignition	1.6000
Fixed solids	3.8000
Hardness	3.2000
Alkalinity	2.0000
Chlorine	0.2000
Free Ammonia	0.0069
Albuminoid ammonia	0.0020
Nitric acid	Trace
Nitrous acid	None
Oxygen for oxidation	0.0390
Iron	Trace

STABLE DRAINAGE.

To 990 c. c. of this water, 10 c. c. of the drainage from a barn cellar were added. The cellar was not in a very filthy condition. The solution contained one per cent of the drainage and gave these results. The figures in parentheses show the additions made by the polluting substance:

Odor		Slight
Color		Slightly brownish and turbid
Evaporation		Quiet
Residue		Uniform and gray
Ignition of residue		It darkens little
Total solids	(1.0000)	6.4000
Loss on ignition	(0.6000)	2.2000
Fixed solids	(0.4000)	4.2000
Hardness	(0.0000)	3.2000
Alkalinity	(0.0000)	2.0000
Chlorine	(0.0000)	0.2000
Free ammonia	(0.0057)	0.0126
Albuminoid ammonia	(0.0106)	0.0122
Nitric acid	(0.0600)	0.0600
Nitrous acid	(0.0000)	None
Oxygen for oxidation	(0.2052)	0.2442
Iron	(More)	Strong trace

SINK WATER.

A one per cent solution of sink-drain water was made with the same well water. It gave these results:

Odor		Foul, drain-like
Color		Milky and turbid
Evaporation		Quiet
Residue		Uniform and gray
Ignition of residue		It smokes and blackens
Total solids	(2.4000)	7.8000
Loss on ignition	(2.0000)	3.6000
Fixed solids	(0.4000)	4.2000
Hardness	(−0.9000)	2.3000
Alkalinity	(1.5000)	3.5000
Chlorine	(0.1000)	0.3000
Free ammonia	(0.0045)	0.0114
Albuminoid ammonia	(0.0426)	0.0446
Nitric acid	(0.0600)	0.0600

Nitrous acid	(0.0000)	None
Oxygen for oxidation	(0.4972)	0.5362
Iron	(More) Strong trace	

URINE.

A one per cent solution of fresh urine was made with the same water. It analyzed with the following results:

Odor	Pungent or urinous	
Color	Milky and turbid	
Evaporation	Quiet	
Residue	Uniform but yellowish	
Ignition of residue, it smokes, emits unpleasant odor, and blackens intensely. The blackening persists.		
Total solids	(39.8000)	45.2000
Loss on ignition	(26.0000)	27.6000
Fixed solids	(13.8000)	17.6000
Hardness	(3.2000)	6.4000
Alkalinity	(3.0000)	5.0000
Chlorine	(5.8000)	6.0000
Free ammonia	Enormous quantity	
Albuminoid ammonia	Enormous quantity	
Nitric acid	(0.1000)	0.1000
Nitrous acid	(0.0000)	None
Oxygen for oxidation	(3.4710)	3.5100
Iron	(More) Strong trace	

LEAVES.

A quite strong decoction of decaying apple-tree leaves was prepared and a one per cent solution of this made with the same water. It gave these results:

Odor	Herb-like, or grassy	
Color	Yellowish	
Evaporation	Foamy	
Residue	Brownish and in circles	
Ignition of residue	It blackens intensely and persists	
Total solids	(7.6000)	13.0000
Loss on ignition	(7.2000)	8.8000
Fixed solids	(0.4000)	4.2000
Hardness	(0.0000)	3.2000
Alkalinity	(0.5000)	2.5000
Chlorine	(0.0000)	0.2000
Free ammonia	(0.0371)	0.0440

Albuminoid ammonia	(0.0369)	0.0389
Nitric acid	(0.0000)	Trace
Nitrous acid	(0.0000)	None
Oxygen for oxidation	(4.5330)	4.5720
Iron	(More)	Strong trace

By comparing these results, it is noticed that foaming during evaporation is quite characteristic of vegetable pollution. Circles in the residue signify the same. All polluted waters do not give a residue that blackens strongly on ignition; the residue of some very bad waters scarcely darkens. The ratio of total solids to loss on ignition gives valuable evidence whether there is pollution. The ratio should not be less than 4, or 3 at the lowest, unless the total solids are below 5; then it may be somewhat lower. The ratio of fixed solids to hardness offers some testimony, as will be seen from the examples. The relation of hardness to alkalinity gives valuable evidence in some instances, and also gives good insight into the mineral constitution of the water. For instance: if the hardness and alkalinity are very nearly the same, both are caused by carbonate of lime or magnesia; if the hardness is greatly in excess of the alkalinity, it is mostly due to sulphates or chlorides of lime or magnesia; if the alkalinity is in excess of the hardness, then an alkali-carbonate is present, and sanitarily it might indicate pollution, — for example, wash-water containing soap. (See example, sink water.) In the experiment with urine, if it had fermented, as is likely to be the case in actual pollution from vaults, the alkalinity would probably be in excess. Chlorine and nitrates are quite characteristic of pollution from animal matter and sewage, though it must not be inferred that a water is not contaminated from these sources, necessarily, even if it contains but very little of them. Ammonia and the oxygen consumed in oxidation furnish very valuable evidence of pollution.

The experiment with urine gave so much ammonia, and consumed so much time from the slow decomposition of urea, that it was not deemed necessary to complete it; portion after portion of the distillate continued to contain large quantities of ammonia. If fermentation had taken place, the results would have been quite different; a very large quantity of ammonia would have been evolved, but much more rapidly. From the experiment, it appears that iron may have some significance. All the polluted

samples contain more iron than the pure one, but as this metal is so generally and unevenly distributed in the soil, it would be hardly safe to attach much importance to it as a sign of contamination.

Using the results of these experiments, any one can calculate what results would have been obtained had any other given percentage of the polluting substance been taken, by dividing or multiplying the increment and adding the result to the uncontaminated water. Estimate the pollution from the stable drainage or sink water at one tenth of one per cent, and comparatively low figures are obtained. But who would care, knowingly, to drink water containing even this small amount of filth? I am convinced that the condemnation figures usually accepted have not been placed too low. A rigid adherence to figures still lower would add to both health and life.

The question of public water supplies deserves notice. Without doubt the supply of large cities is less likely to become much contaminated than that of smaller places, because greater vigilance is exercised by cities over their water supply. Many cities make an analysis of the public supply daily; consequently the first signs of unusual pollution are detected and action taken. But is the average city water supply sufficiently pure? A fair answer to the question may be obtained by comparing the vital statistics of one city with those of another. They show that those cities which are supplied with the purest water suffer least from typhoid fever and other diseases attributable to poor water; in other words, cities suffer from the diseases named nearly in proportion to the quality of the water with which they are supplied. About 60 per 100,000 of the inhabitants of Philadelphia die annually of typhoid fever; New York records about 25; Boston, about 40; Brooklyn, about 15. These numbers correspond to the purity of their water supply. Vienna, by changing from the polluted Danube to pure springs, reduced her cases of typhoid fever from 340 to 11 annually per 100,000 inhabitants. There is evidence enough that pure water saves life, and that the average city water is not sufficiently pure. Indeed, it is not to be believed that a standard for the purity of drinking-water can be obtained from natural water of ponds and rivers at all seasons of the year, although they receive no sewage, any more than it is to

be believed that it would be better for us to eat all our food raw. If our more sensitive nature and higher intelligence teach that it is better to prepare our food and not to take it as the brute does, should they not also teach the advisability of purifying our drinking-water if it is not already pure?

During a large part of the year, more or less vegetable matter exists in all open sources of water, as ponds and rivers. Decaying vegetable matter, if taken into the system, has its deleterious effects.

But how can water be purified in sufficient quantity for a city supply?

The best method in practical operation of which I have been informed is that at Antwerp, Belgium, of which the following is a description: At first they employed a method of filtering through spongy iron and sand, but soon abandoned it. A system of purifying water by agitation with iron and by sand filtration has been adopted with good results at Antwerp, where the water supply is taken from an impure source, the river Nethe. Large iron cylinders are mounted horizontally on hollow trunnions and a slow, rotating movement is given them by means of spur gearing. One pipe delivers the water into the cylinder against a disc which acts as a distributor. The outlet pipe is fitted with an inverted funnel up which the water passes so slowly as to allow the precipitation of the iron particles. The cylinders are filled to one tenth their capacity with iron borings. After the water leaves the outlet pipe, it is flowed through a sand filter.

The results of purifying water by this method have been stated by Mr. W. Anderson, as follows:

1. The chemical nature of the organic matter is changed, and existing albuminoid ammonia is reduced from one half to one fifth of its original amount.
2. The water is softened by the precipitation of the carbonate.
3. Infusorial life is largely destroyed and modified.

The area occupied by apparatus for dealing with 2,000,000 gallons per day is 29 feet by 24, and the cost of the iron consumed and for cleaning the filters is only $3 per million gallons. The cost of plant and apparatus having the capacity for 2,000,000 gallons per day is about $8,000.

Regarding the efficiency of the process, Mr. Anderson says

further: "It was observed from the first that the animal and vegetable life which was so abundant and troublesome in the natural waters of the Nethe, lying over the spongy iron filters, had quite disappeared in the water, otherwise in exactly the same circumstances, lying over the sand filters, and I always supposed that this was due chiefly to mechanical filtration through the spongy iron having separated all the germs, spores, and seeds which came to life above it; but during the recent hot weather it has been found that the water from the 'revolver,' though it contains all the impurities of the natural water, has been modified by the action of iron to such an extent that neither animal nor vegetable life is apparent over the sand filters. Without presuming to draw very wide inferences from this fact with reference to the action of iron upon organisms connected with disease, it may, at least, be pointed out that the absence of visible life in water treated with iron on a large scale confirms, in a great measure, the experiments of Dr. Frankland, Dr. Voelcker, Mr. Halton, Professor Bischof, and others."

For the sake of testing on a small and imperfect scale the efficiency of the iron and sand method of purifying water, I performed the following experiments: A water known to be polluted was obtained and analyzed; then a quart of it was shaken for five minutes in a five-pint bottle with about one ounce of iron borings, filtered through sand and analyzed. Another portion of the original water was boiled about fifteen minutes, allowed to settle, and the quite clear liquid decanted and analyzed. This was for the purpose of comparing the effect of boiling with the other methods of purification. To another portion of the water some ferric chloride was added in such proportion that one part of metallic iron was used for 100,000 parts of water; it was allowed to stand five minutes and then filtered through sand. The following results were obtained:

POLLUTED WATER BEFORE TREATMENT.

[The figures express parts per 100,000.]

Odor	Slight
Color	Dull yellow
Evaporation	Foamy
Residue	Yellowish and in circles

Ignition of residue	It blackens intensely
Total solids	11.8000
Loss on ignition	5.6000
Fixed solids	4.6000
Alkalinity	3.3000
Chlorine	0.8000
Free ammonia	0.0302
Albuminoid ammonia	0.0556
Nitric acid	0.3000
Nitrous acid	None
Iron	0.0280
Oxygen for oxidation	0.7312

POLLUTED WATER AFTER BOILING.

Odor	None
Color	About twice as yellow as in first case
Residue	Yellowish and in small circles
Evaporation	Foamy
Ignition of residue	It blackens intensely
Total solids	11.0000
Loss on ignition	4.6000
Fixed solids	6.4000
Hardness	3.0000
Alkalinity	3.5000
Chlorine	0.8000
Free ammonia	0.0308
Albuminoid Ammonia	0.0210
Nitric acid	0.3000
Nitrous acid	None
Iron	0.0360
Oxygen for oxidation	0.6435

POLLUTED WATER TREATED WITH METALLIC IRON.

Odor	None
Color	Little yellowish and turbid
Evaporation	Quiet
Residue	Nearly uniform, yellowish
Ignition of residue	It scarcely darkens
Total solids	9.4000
Loss on ignition	2.6000
Fixed solids	6.8000
Hardness	3.0000
Alkalinity	5.2000
Chlorine	1.2000
Free ammonia	0.0300

Albuminoid ammonia	0.0136
Nitric acid	0.3000
Nitrous acid	Trace
Iron	0.1050
Oxygen for oxidation	0.1755

POLLUTED WATER TREATED WITH FERRIC CHLORIDE.

Odor	None
Color	Nearly clear
Evaporation	Quiet
Residue	Uniform, yellowish
Total solids	11.8000
Loss on ignition	3.8000
Fixed solids	8.0000
Hardness	3.3000
Alkalinity	7.5000
Chlorine	2.0000
Free ammonia	0.0298
Albuminoid ammonia	0.0116
Nitric acid	0.3000
Nitrous acid	Trace
Iron	0.1520
Oxygen for oxidation	0.2340

Another sample of polluted water was analyzed both before and after boiling, with the results given below. The figures express parts per 100,000. The first column represents the condition of the water before boiling, the second that of the water after boiling half an hour and settling.

Odor	Foul.	Slight
Color	Yellowish.	Yellowish
Evaporation	Little foamy.	Little foamy
Residue	Yellow and in flakes.	Yellow and in circles
Ignition of residue	It blackens.	It blackens some
Total solids	11.0000.	8.4000
Loss on ignition	4.6000.	2.8000
Fixed solids	6.4000.	5.6000
Hardness	4.3000.	2.3000
Alkalinity	3.6000.	3.2000
Chlorine	0.5000.	0.7000
Free ammonia	0.0438.	0.0016
Albuminoid ammonia	0.0384.	0.0260
Nitric acid	Little.	Trace
Nitrous acid	None.	None
Iron	0.5000.	0.3000

The experiments show that boiling for half an hour very materially changes the character of the water. The carbonates of the earth-metals are precipitated, thus softening the water; much of the organic matter is also precipitated, and all germs are destroyed. Thus every family has at hand the best possible means for purifying its drinking-water. The water may be swarming with disease germs; it will come from the boiling kettle perfectly harmless and wholesome. There can be no objection to this method worth considering. It should receive the most hearty acceptance and practice by every family obliged to use water which is at all questionable. The labor and expense required for it are so trifling as to be insignificant. It is estimated that 30,000 people die in the United States, annually, from typhoid fever alone.

It appears to be well established that the majority of cases are communicated through water. Suppose 20,000 of the fatal cases were so contracted; then the precaution to boil drinking-water would save 20,000 lives annually, and a 100,000 hearts from mourning. But it would do more than this. Look at the list of diseases which the illustrations given in this paper show may be caused more or less directly by drinking impure or poisonous water: Colic, headache, erysipelas, sore throat, constipation, sore mouth, gastritis, pneumonia, dysentery, consumption, bilious fever, liver diseases, skin diseases, rheumatism, dyspepsia, and general debility. The boiling of drinking-water would save a host from pain and death. I desire to emphasize this because the remedy is so simple.

The experiments on the purification of water by iron give remarkable results, and fully confirm the claims made for the system at Antwerp. The germ theory of disease has assumed so much importance that whenever any system of water purification is proposed it is naturally asked whether it has any influence upon germs. I regret that time and opportunity have prevented us from making biological tests in connection with the experiments. I do not know that any one has experimented in this direction with the metallic iron and sand process, or with the ferric-chloride and sand method; but the following quotation very closely approaches the subject and is from high authority.

T. F. Frankland recently reported to the Royal Society of England a series of experiments upon the purification of water. In his paper, speaking of filtration, he said: "Thus green sand, coke, animal charcoal, and spongy iron were at first successful in removing all organisms from the water passing through them, but after one month's continuous action this power was in every case lost. The improvement still effected, however, by spongy iron and coke was very great indeed, while the green sand and brick-dust were much less efficient, and the number of organisms in the water that had been filtered through charcoal was greater than in the unfiltered water."

If the methods employed by Dr. Frankland did remove all organisms for a time, it is certainly encouraging. If any system is efficient for a time, its continued efficiency is, doubtless, possible. The importance of the subject leads us to make further inquiry about disease germs and water. They may be communicated, no doubt, by pure water, if they are in it. But do they prefer to live in pure water? Can they flourish in pure water? Referring to wells more particularly, why is typhoid fever so closely associated with organically impure water, and not equally with pure water, if the natural process of filtration fails to remove disease germs? These questions do not seem to have been considered. Does the organic impurity in the water itself have nothing to do with their presence or their virulency? Why do biologists use nutrient preparations for the culture of bacteria? Why not, in the culture experiments, use distilled water alone? It is evident, germs require certain conditions to vitalize them; a grain of wheat which has fallen upon a stone will not germinate, but it responds to the touch of fertile soil. The principles of life are as fixed and as definite as any which govern in the mineral kingdom. If there is but one germ in the first place, millions will develop in a nutrient fluid in a short time; but if there is no nutrient fluid the germ will remain dormant indefinitely.

But how came the germ in the polluted well? It is easier to understand how it came to be in river water from the inflow of sewage containing the dejecta of patients. But is it not just as likely to be in this pure well as in that polluted one up among the hills? On the ground of the germ theory of disease, how can sporadic and isolated cases of typhoid fever be explained,

breaking out, as they often do, miles, perhaps hundreds of miles, from where any case ever occurred, unless we suppose that germs have been conveyed there by winds, by storm clouds, or currents of air, to await, in a dormant condition, the quickening influences of suitable environments? How can their causative effect to produce disease be so closely associated with polluted water and not with water organically pure, unless polluted water is a culture fluid, not only to vitalize one germ but to nourish its multiplied millions, and unless the probability of becoming inoculated is greater from drinking a thousand disease germs than from drinking one?

If a man should remove the body of a rat just drowned in his well, would he not most easily prevent pollution of the water? Grant, then, that no possible kind of filtration can remove bacteria, but what if they should be prevented? There are evidently two cases connected with the subject of germs and water: one where the water supply simply conveys the germ, the other where it is both a culture fluid and a vehicle. Therefore, whatever removes or destroys organic matter in water not only prevents the increase of poison from further decay, but also retards the multiplication of germs by removing their pabulum. An ounce of prevention is better than a ton of cure.

TREATMENT OF THE DROWNED.*

ISSUED BY THE NEW HAMPSHIRE STATE BOARD OF HEALTH.

The numerous cases of accidental and suicidal deaths by drowning during every month in the year, and especially the accidental during the winter months occasioned by treacherous ice and unwisely daring individuals, seem to call for the promulgation of some methods, simple in practice and easily understood by every intelligent person, when carefully studied, by which many individuals might be saved from death every year.

There are several ways of accomplishing the resuscitation of the drowned, the same principle and object governing all, that is, the restoration of respiration, or breathing, and the normal warmth of the body. The methods herewith presented are quite as effectual as any.

Fig 1.

Two things to be done: Restore breathing; restore animal heat.

*The cuts which illutrate this article, as well as a large part of the latter, were first presented by the Michigan State Board of Health several years ago. The Rhode Island State Board of Health has recently published the article here given, and through the courtesy of that board the cuts are furnished.

Rule 1. Remove all obstructions to breathing. Instantly loosen or cut apart all neck or waist bands; turn the patient on his face, with his head down hill; stand astride the hips with your face toward his head, and, locking your fingers together under his belly, raise the body as high as you can without lifting the forehead off the ground (Fig. 1), and give the body a smart jerk to remove mucous from the throat and water from the windpipe; hold the body suspended long enough to slowly count one, two, three, four, five, — repeating the jerk more gently two or three times.

Fig. 2

Rule 2. Place the patient face downward and, maintaining all the while your position astride the body, grasp the points of the shoulders by the clothing, or, if the body is naked, thrust your fingers into the armpits, clasping your thumbs over the points of the shoulders, and raise the chest as high as you can (Fig. 2) without lifting the head quite off the ground, and hold it long enough to slowly count one, two, three. Replace him on the ground with his forehead on his flexed arm, the neck straightened out, and the mouth and nose free. Place your elbows against your knees, and your hands upon the sides of his chest (Fig. 3) over the lower ribs, and press downward and inward with increasing force long enough to slowly count one, two. Then suddenly let go, grasp the shoulders as before and raise the chest (Fig. 2);

then press upon the ribs, etc. (Fig. 3). These alternate movements should be repeated ten to fifteen times a minute for an hour at least, unless breathing is restored sooner. Use the same regularity as in natural breathing.

Fig. 3.

Rule 3. After breathing has commenced, restore the animal heat. Wrap him in warm blankets, apply bottles of hot water, hot bricks, or anything to restore heat. Warm the head nearly as fast as the body, lest convulsions come on. Rubbing the body with warm cloths or the hand, and slapping the fleshy parts may assist to restore warmth and the breathing also. If the patient can surely swallow, give hot coffee, tea, milk, or a little hot sling. Give spirits sparingly, lest they produce depression. Place the patient in a warm bed, and give him plenty of fresh air; keep him quiet.

BEWARE!

Avoid delay! A moment may turn the scale for life or death. Dry ground, shelter, warmth, stimulants, etc., at this moment are nothing; artificial breathing is everything, is the one remedy, — all others are secondary.

BE PROMPT!

Do not stop to remove wet clothing before efforts are made to restore breathing. Precious time is wasted, and the patient may be fatally chilled by exposure of the naked body, even in summer. Give all your attention and effort to restore breathing by forcing air into, and out of the lungs. If the breathing has just

ceased, a smart slap on the face or a vigorous twist of the hair will sometimes start it again, and may be tried incidentally, as may, also, pressing the finger upon the root of the tongue.

Before natural breathing is fully restored, do not let the patient lie on his back unless some person holds the tongue forward. The tongue by falling back may close the windpipe and cause fatal choking.

If several persons are present, one may hold the head steady, keeping the neck nearly straight; others may remove wet clothing, replacing at once with clothing which is dry and warm; they may also chafe the limbs, and thus promote the circulation.

Prevent friends from crowding around the patient and excluding fresh air; also from trying to give stimulants before the patient can swallow. The first causes suffocation; the second fatal choking.

Do not give up too soon. You are working for life. Any time within two hours you may be on the very threshold of success without there being any sign of it.

In suffocation by smoke or any poisonous gas, as also by hanging, proceed the same as for drowning, omitting effort to expel water, etc., from the air passages.

In suspended breathing from effects of chloroform, hydrate of chloral, etc., proceed by Rule 2, taking special pains to keep the head very low, and preventing closure of the windpipe by the tongue falling back. Grasp the tongue between the forefinger and thumb, draw forward and hold.

PERSISTENT EFFORTS TO RESUSCITATE THE DROWNED.

Prof. C. R. Kedzie, ex-president of the Michigan State Board of Health, says in relation to the foregoing article, and in urging persistence of efforts to resuscitate the drowned:

"This bulletin has been widely distributed, and it has been republished by many papers in our State. It has been adopted by many other state boards of health and by city boards of health. It has secured a wide dissemination in our country. How much good has thereby been secured, it is impossible for me to state; but I have good reason to fear that life is often sacrificed because energetic efforts at resuscitation are abandoned too soon. I desire once more to urge upon the public the duty of

persistent efforts to resuscitate the drowned and to repeat with emphasis one direction of the bulletin: 'Do not give up too soon; you are working for life. Any time within two hours you may be on the very threshold of success without there being any sign of it.'

"The efforts which are successful in restoring a human being to life certainly are not useless, and it is wicked to refuse or neglect to make such efforts, unless the absolute certainty of death is established. It is not enough to say that the person appears to be dead. Persons who gave no signs of life for a long time after being taken out of the water have yet been brought to life by appropriate efforts. I most earnestly protest against treating the drowned as dead merely because they appear lifeless. I am fully persuaded that many such persons die because no adequate efforts are made for their recovery. Persons may swoon, and for a time appear to be dead, but we do not assume that they are dead and leave them to their fate, but make energetic efforts to restore consciousness. No more should we assume the fact of death in the drowned, but should make like efforts to restore them to life.

HOW NOT TO DROWN.

"How to drown is an art that seems to be well understood and frequently practiced the world over. How not to drown is an art not so well understood, and requires some notice at the hands of this board. Drowning could be prevented if we could secure either of the following conditions: 1. That everybody should know how to swim. 2. That nobody should ever go into the water. But as we cannot secure either of these conditions in the present order of things, we turn our attention to some means of reducing these accidents to their minimum of danger.

"Much good advice is often thrown away upon persons who find themselves suddenly thrown into the water: 'Keep cool;' 'Do not lose your presence of mind,' etc. The conditions are very favorable to follow the first advice in a literal sense, for the water itself will assist one to get cool and to keep so indefinitely; but when a person is suddenly compelled to face death in an unexpected form, the advice to 'preserve your presence of mind'

is usually driven out of the mind by overwhelming terror, and the person too often becomes absent-minded in an awfully literal sense of the word.

"The solids and liquids of the body are all heavier than water, but the living body, on account of the air in the lungs, stomach, and bowels, is slightly lighter than water; and so long as these cavities remain filled with air, the body will float in water, and a small part of the body can be kept above the water. While it is true that so long as the lungs, etc., are filled with air, the body is lighter than water, the difference in specific gravity is small, and only a small part of the body will float above water. What part will be above water depends upon the relative position of other parts of the body; if the legs are flexed and the arms thrown in front of the body, the center of gravity is in the anterior portion of the body, and the top of the shoulders and back of the head only will be above water; the face being under water, respiration will be impossible under such circumstances. But if the legs are straightened out and the arms thrown behind the body, the face will be brought above the water. In the attempt to float, therefore, the legs should be straightened out, the head thrown back, and the arms held behind the body; the face will then float above the water so long as this position is maintained. If one part of the body is thrown out of the water, a corresponding amount of the body will be submerged; if the arms are held out of the water, the head will go under. I remember the case of a boy who thought he could greatly increase his power to swim by tying an inflated bladder to each foot, but when he entered the water he came near drowning, because his feet were kept out of the water, but his head under water, and he soon became practically convinced that it was important that his head rather than his heels should be in the air.

"If the mouth and nose are kept above water, respiration may go on without interruption, and life may be sustained indefinitely under such circumstances. This may be secured in still water by merely floating with the face upward, every other part of the body being kept constantly under water. But with very little exertion a person may do more than keep his nose above water, even if he is ignorant of the art of swimming. I have

seen persons 'tread water' by making the same movements with the legs as in walking up stairs, and thus keep the entire head out of water for a long time. If a person will add to this certain corresponding movements of the hands, — in fact, make the same movements of both arms and legs that he would in climbing a vertical ladder, but without lifting the arms out of the water and without closing his hands in the downward movement of the arms, — he may keep his head out of the water even when the waves are running high, and may keep from drowning for hours. Whenever a person finds himself in the water and in danger of drowning, let him assume as speedily as possible a vertical position, and at once begin the same movements as in climbing a vertical ladder, — let him climb for life, — and he will be surprised to find with what slight exertion he can keep his head above water; let him be satisfied with this, for he may exhaust himself in vainly attempting to do more."

PADDLING THE WATER AS A MEANS OF AVERTING DROWNING.

The following communicatian from Dr. MacCormac, of Belfast, is inserted as imparting valuable information on this important subject:.

"Already the season has been ushered in by a number of deaths, some of them occurring in our very midst, from drowning. The means of safety, or relative safety, which I have to point out are so very simple and, as I believe, so effective, that I am lost in wonder that no one has thought proper to insist upon them, as in the following remarks it is my intention to do. Swimming, as ordinarily practiced, is not the most sufficing means for escaping the dangers of the water. It needs some instruction to be able to swim, and practice to be able to swim well. No doubt it is desirable to swim and to swim well, but the great majority of persons of both sexes do not know how to swim at all. Yet unless people can swim and swim well, — and even then they are not always successful, when the emergency comes, in preserving life, — swimming is, I am persuaded, not so effective a preservative as is conjoint paddling and treading water. As a rule subject to few exceptions, persons precipitated into the water do not swim without previously learning. But paddling with the hands

and treading with the feet require no prior instruction, and in the great majority of cases would save life. In swimming, the mouth is on a level with the water in the intervals of the strokes; in paddling, the head is well elevated, the individual is able to look about, he can deliberate as to what is best to be done, and he is much less liable to take water into the larynx or glottis, a casualty which, I am persuaded, causes the destruction of many. Without prejudice to the art of swimming, I would have children exercise in household tanks from the tenderest age, in the act of paddling and treading water, so as to impart the confidence which unreasoning dread tends to lessen or take away when one is suddenly immersed in an unusual medium. The animal, the quadruped, begins to paddle at once when cast into the water, but as man does not habitually employ the anterior limbs as organs of locomotion, reason must tell him that he may, if he pleases, employ them as organs of locomotion in the water, just as readily as any four-footed animal. To be sure, a man has not the habit of using his hands and arms for locomotion, as the brute has, but otherwise how much more available is the paddle-shaped hand than a hoof or a paw. Again, the man with little or no instruction, by throwing his head well back, can float and rest at pleasure, a thing of which the brute has no conception whatever.

"Of course a little preliminary habitude is desirable, but without any preliminary habitude whatever, there is nothing to hinder man, woman, or child, were they unable, in common parlance, to swim a stroke, from beating water with the hands and feet, just as the lower animals do, and so keep themselves afloat for a protracted period, a period that in a multitude of instances would be found sufficient to invite rescue and preserve life. The action of the feet down will sustain the body; the action of the hands down will do so; *a fortiori*, the action of both will prove yet more effective. I have tried myself, one alone, or both together, nay, with a single hand only, in bygone years, I am sure, hundreds of times. There is no occasion for fuss or bustle. The body, taken as a whole, is actually lighter than water, bulk for bulk, and a very moderate amount of paddling with feet and hands will be found perfectly adequate to sustain and guide its

movements. In fact, so long as the individual paddles, as I here direct, he cannot sink. A horse, or dog, or cow, or cat, or swine, when immersed in water, begins instantly to paddle, and that without any prior instruction or exercise whatever. Now a man, or woman, or child has only to do as the inferior animal does, and he, or she, or it will float necessarily and inevitably. The place being otherwise safe and boats at hand, boats' and ships' crews, a regiment of soldiers, schools, and the like, might jump into deep water and paddle themselves into security without risk or failure. In this, as in many other things, man is too often unaware of his own immense capacities.

"Animals not habituated to the water will often take to it spontaneously, or, if cast into it, sustain themselves for indefinite periods. Dogs often gain the shore when ships and their crews have been lost. Some years ago a dog landed at the Cape of Good Hope with a letter in his mouth. The vessel to which he belonged had gone down with all hands, but if the men had paddled as the dog paddled, all their lives might have been preserved. Indeed, I know for certain that formerly it was the practice at the Cape for men to paddle out, it was termed 'treading water,' and bear communications to and from vessels in the offing, where no boat could live. It was, and I believe is still, the case at Madras, similarly. Natives at the Island of Ioanna, in the Mozambique Channel, treading water, come out, bearing fruit on their heads to the vessels, miles distant. The young people in the islands of the Pacific breast the gigantic breakers out of mere sport. The Indians of the Upper Missouri traverse the impetuous current, invariably paddling and treading water.

"Short instructions for paddling and treading water ought to be posted up in all schools, barracks and bathing places; wherever, in short, people have to do with the sea or with masses of water. It should be shown how easy it is, with a little well-directed effort, to preserve life, and how the yearly and calamitous destruction which besets our shores might now, and haply for all time to come, be effectively stayed."

One precaution is necessary for a person who is paddling and treading water, to avoid strangling; when cold water is suddenly dashed into the face, an automatic or involuntary inspiratory

effort or "catching the breath" is caused, and if the face at the instant is covered with water, strangulation from drawing water into the lungs is the result. When waves are dashing in his face, the person must guard himself against this spasmodic inspiration by holding his breath at such times, or he may even grasp his nose and close his mouth with one hand and thus prevent the possibility of strangulation, if such effort can be made without sinking the body too low in the water.

CHEST DEVELOPMENT IN YOUNG PERSONS.

BY J. J. BERRY, M. D.,
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In the perfection of modern educational methods, the physical needs of the individual have been almost entirely ignored. Facilities for the acquirement of strength and endurance have been, to a great degree, wanting. Teachers have, as a rule, possessed no knowledge of the laws of physical growth and development, and consequently the student who desired to perfect himself physically was obliged either to exercise according to his best judgment, which is bad, or to put himself under the care of incompetent instructors, which is even worse. The past few years have, it is true, given us gymnasia and various apparatus for physical development, but have they been properly used? Evidently not. In the report of the Commissioner of Education for 1889, that official regrets his inability to report a general adoption of physical training in the public schools and says that "though thousands of dollars have been invested in apparatus to be used in the development of the mind, no provision worthy of serious consideration has as yet been made for strengthening the body, upon whose sound condition effective mental effort greatly depends."

It is not my intention to advance, in the present paper, the claims of physical education, or to illustrate the definite and remarkable results of judicious and persistent exercise. I prefer rather to bring to the attention of parents, teachers, and others but one phase of the question, which seems to me to outrank all

others in its importance to the present, as well as to future generations. The child who first enters the school-room is deficient physically as well as mentally. The body is undeveloped and often unsymmetrical. There is most likely imperfect lung expansion from the very first, and, in default of any rational treatment for it, the condition becomes more and more exaggerated until finally it is past all hope of remedy. The student may have attained a high degree of scholarship, but he has acquired at the same time a physical conformation unfit for endurance and incapable of resisting disease. Consumption destroys fully one seventh of our population, and it is during school life that the foundations of the disease are too often laid. It is pre-eminently a disease of imperfect nutrition. It attacks the crippled and poorly developed lung just as certainly as it shuns the one which is fully expanded and in constant and active service. Numerous observations have established the existence of a constant ratio between consumption and deficient lung expansion. In those cases where the degree of development fell below a certain figure, chronic disease was extremely prevalent, while in the others it was of extremely rare occurrence. In view of these and other facts, it is extremely doubtful whether consumption can co-exist with complete lung expansion.

The effects of this form of physical culture have been so well summarized by a recent writer that a few extracts from his article are here quoted. He states: "While it is true that many undeveloped persons enjoy fair organic health, greater respiratory and muscular power would unquestionably make such lives more effective and longer. A roomy thorax and strong heart are no mean allies in resisting the assaults of disease. A few extra cubic inches of respiratory capacity, or a small reserve of disciplined cardiac power may suffice to determine a favorable issue in pneumonia, pleurisy or typhoid. Every inch which a man adds to his chest measure adds to the measure of his days. Physical development can, perhaps, be excessive, yet resulting injury is limited and personal, whereas neglect of bodily improvement sins against posterity." There is a great lack of information among people generally regarding the beneficial results of such training and the amount of development which may be attained. For the information of such it may be stated that nowhere are

these effects more definite and invariable. They are as capable of demonstration as any mathematical problem, and no one need fail to secure results proportionate to the amount of labor expended. Abundant confirmatory evidence may be found in almost any work on this subject.

By one hour's daily exercise for eight months, twelve men from nineteen to twenty-eight years of age were found by Maclaren to have gained an average of two and seven eighths inches in chest expansion, while the greatest gain in a single individual was five inches. In four and a half months, twenty-one students of Woolwich Academy, averaging eighteen years of age, gained on an average two and five tenths inches in chest measurement, while the largest gain was five and a quarter inches. At the end of one year's steady practice, two persons, aged sixteen and twenty years, were found to have gained in chest growth five and six inches respectively. The reports from Amherst College, as reported by Dr. Hitchcock, show that the students, at the end of their four years' course, by a half hour's light exercise four times a week, gained one and twenty-one hundredths inches in chest expansion, while those of Bowdoin College, by the same expenditure of time in heavier exercises, gained in six months one and seventy-five hundredths inches. These figures not only serve to illustrate the constant and progressive growth that occurs, but they also indicate that decided improvement may be counted upon even in those who have attained or passed the age of maturity.

In order to more fully appreciate and utilize the various methods for promoting chest development, it is necessary to consider briefly some points in the anatomy and physiology of the lungs. These may be described as collections of air cells, inclosed within elastic walls composed of bones and muscles and bounded below by a strong muscular partition which forms the floor of this cavity and which is known as the diaphragm. Their function is respiration, a process by which oxygen is introduced into the body and effete material removed from the same. The respiratory act is composed of two movements, inspiration and expiration. During the first the chest is enlarged in all its diameters — vertically, by the contraction and descent of the diaphragm, and transversely and laterally by the rotation of the

ribs upon their axes and the action of the various muscles attached to the chest walls. During expiration, the reverse occurs. The diameters of the cavities are shortened by the ascent of the diaphragm, the depression of the ribs, and the recoil of the elastic tissue of the lungs. When it is performed forcibly, several of the chest and abdominal muscles share in the act. Inspiration is an active process and most of the force exerted is for the purpose of overcoming the resistance offered by the elastic tissues of the lungs and of the cavity containing them. Hence the necessity for muscular development in these parts. In the physiology of respiration we find many important and suggestive facts which have a direct bearing on the subject in hand.

The capacity of the lungs is about two hundred thirty cubic inches. Of this amount of air, about one hundred cubic inches remains constantly within them and cannot be expelled. It is renewed very slowly under the laws governing the diffusion of gases. About one hundred more cubic inches is more rapidly changed, as it can be taken in and expelled by means of forced breathing. During ordinary inspiration, however, only about twenty or twenty-five cubic inches is inhaled and only about one tenth of the whole amount is renewed. It has been shown, and this can be understood from the facts above quoted, that the capacity of these organs is nearly a third greater than is really necessary to support life, the surplus being held in reserve for emergencies which may arise. Hence it follows that if two thirds or three fourths of the lungs perform the work of the whole, there are portions which remain inactive. And such is really the case. The apices and small sections of the circumference and bases are, in many persons and by ordinary methods of breathing, very little used, and it is a most suggestive fact that these are the very portions of the lungs which are first seized upon by consumption. Mays has recently offered valuable negative proof of the above by showing that women who lace excessively and are thus obliged to practice clavicular breathing, are remarkably free from disease of the upper thirds of the lungs.

To fully develop the chest and put into active service each individual air-cell, is therefore the object of the gymnastic exercises here described. The proper performance of the respiratory

act forms the basis of all successful methods for chest development. The most careful and persistent training will accomplish little if this essential be disregarded. We cannot hope to increase the chest capacity simply by developing the muscles upon the exterior walls. These, it is true, sustain the head and shoulders, and assist in elevating the ribs, but it is really the pressure outwards exerted by the dilating air-cells which does a greater part of the work. The muscles are merely adjuvants.

There are three ways by which air may be taken into the lungs: First, by pressing the latter outwards against the walls of the chest, — the method most commonly practiced ; second, by drawing the lungs upward by the action of the collar-bone and shoulder-blades ; and third, by contracting the diaphragm and abdominal muscles, and allowing the lungs to dilate from their bases upward. This latter is the only true method of breath-taking, and should be thoroughly mastered before proceeding further. It is perhaps unnecessary to state that in this, as in all other gymnastic exercises, the clothing should be loose and free about the waist.

Begin as follows: Stand erect and with head and shoulders drawn well backwards. Expel all the air from the lungs by contracting the chest and abdominal muscles. Next, holding the chest quite immovable, allow the air to enter the lungs by the action of the abdominal muscles alone. If properly performed, the first movement will be a protrusion of the abdomen and an increase in the transverse diameter of the lower portion of the chest. Inhale at first only a moderate amount of air, but gradually increase the depth of the inspiration as you become proficient in the exercise. Remember that the protrusion of the abdomen and the expansion of the chest occur almost simultaneously during each inspiration. Having filled the lower portions of the lungs in the manner described, the two first methods above noted may be employed to distend the apices. By the abdominal method, the expiratory act is much better regulated, more easily controlled, and is performed with the minimum degree of muscular effort. For these reasons, it forms a prominent part in all kinds of vocal culture. The accompanying diagram illustrates the antero-posterior enlargement of the chest produced by this

method alone. The heavy lines show the contour of the chest after a full inspiration.

One of the more simple exercises is what is known as forced voluntary breathing, practised, of course, after the method above described. Stand erect, and then take slowly a series of deep inspirations. Then take a long breath, and hold it as long as possible. By a little practice, this period may be easily increased from thirty seconds to a minute and a half. Repeat until the lungs feel a little tired. Again take a deep inspiration, and then count in a loud voice as long as you can. One should be able in a few days to reach as high as seventy-five. Exercises such as these will also test your proficiency in abdominal breathing.

Among the out-door resources, running and walking occupy a justly prominent place. Unlike some of the other exercises, they act upon the lungs indirectly by increasing the demand for oxygen on the part of the tissues. While at rest the amount of air used by the lungs per minute is about 430 cubic inches; while walking at the rate of four miles an hour, 2,200 cubic inches; and while walking at the rate of six miles an hour, 3,200 cubic inches. Thus, by the increased depth and rapidity of the inspirations, there is a prompt renewal of the residual air and an expansion o the less used portions. As ordinarily practiced, these exercises sometimes fail to produce satisfactory results. Success here as well as elsewhere, depends in great part upon attention to details. Hence the blame, if any is attributable, lies to the exercises rather than to the method.

Particular attention should be given to the position of the shoulders and chest, and the one exercising should inhale large amounts of air slowly rather than small quantities at frequent intervals.

The novice who attempts to run any considerable distance, soon finds himself out of breath. The respiration becomes short and labored, the pulse rapid, and a sense of extreme exhaustion is promptly experienced. Thereupon the rate of speed naturally becomes lessened, during which time a reciprocal action becomes established between the heart and lungs. The more remote portions of the latter become distended, and thus the increased circulation of blood through the air-cells can be provided for, thereby lessening the strain upon the heart and blood-vessels, and permitting thorough oxidation. Now, under rational methods of training, these phenomena should never occur. The lungs should be equal to all the ordinary demands made upon them, and it is the fault of the individual if they are not. While brisk walking is allowable, fast running is not. All competitive effort and all attempts to break a record are disastrous as regards the objects you are striving to attain. After acquiring as great a walking speed as is consistent with a graceful and easy carriage, begin the running exercise, gradually increasing the distance but not the rate of speed. A five-mile gait is quite sufficient, and a healthy person in good form ought to cover two or three miles easily and without experiencing at any time any marked shortness of breath or sense of exhaustion. This result can be easily secured by persistent practice and careful attention to the foregoing suggestions.

The success of any method of training depends not only upon its inherent worth, but upon the ease and readiness with which it can be put into practice. Gymnastic apparatus is not accessible to the masses, while of those having access to the ordinary gymnasium, but a very small proportion make good use of their opportunities. As regards children, there is absolutely nothing at their disposal. There is demanded, therefore, something which may be always at hand, which is applicable to all ages and thoroughly adapted to the end in view, which is in every particular harmless to the exerciser, which can be used several times daily, and which of itself possesses a sufficient element of interest

to insure its long continued use. All these advantages appear to be possessed by the properly constructed chest-weight. Moreover, by means of various additional fittings, this apparatus offers superior facilities for the development of every portion of the body without any other aid whatever. While numerous chest-weight exercises have been devised for the purpose, there are none which for promoting chest development compare in efficacy with those here described. They have been derived from various sources, and have the commendation of various teachers of physical culture. Others would be here presented were I not confident that far better results are attained by a few exercises practiced long and thoroughly, than by a large number employed hurriedly and indifferently.

So much depends upon the proper construction of the apparatus used, that a description of the kinds advocated will not be out of place. Some are designed for general work, while others are particularly adapted for chest development. The two machines here shown belong more particularly to the latter class, and for the purpose in view, have, in my opinion, no superiors.

No. 1.

No. 1 is known as Dowd's "Home Exerciser." It is a very light piece of apparatus, having single pulleys with swivel and

graduated weights. There is also a floor pulley and other accessories. It presents a very attractive appearance, and besides being specially adapted for the chest exercises, is a good all-round machine. It costs from $5 to $16.

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No. 2.

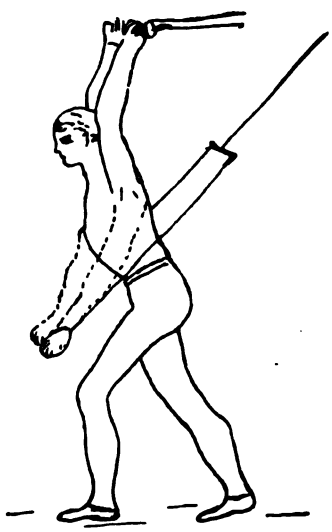
No. 2 is one of the special weights manufactured by the Narragansett Machine Co., of Providence. It is of the same height

as the other, with single swivel pulley-block, and weights running over bronzed steel rods. Price, $5.00.

Both of these are noiseless, wear indefinitely, and are suited to all ages and conditions. For other work, the "No. 13," manufactured by the same firm, is unsurpassed.

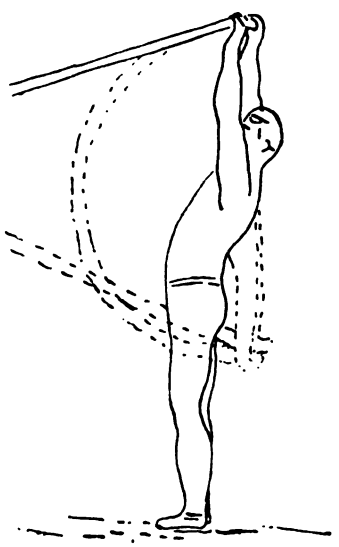
For chest development, the high, single-pulley chest-weights seem to me to possess decided advantages over the compound rope and pulley machines. By means of a single block seven or eight feet from the floor, the traction or recoil, so to speak, is not only more prompt and rapid but is given a stronger upward tendency, thus lifting and rotating the ribs and more effectively increasing the diameters of the chest. The strain upon the shoulder muscles is also considerably relieved, thereby allowing the practice of the exercises for a long time without fatigue. Moreover, the exertion needed to overcome the resistance from above, and to maintain an erect position under the circumstances, serves to increase the power of the chest, back, and abdominal muscles also. In fact, there are few trunk muscles which cannot be developed with this sort of pulley. Those, therefore, who purchase but a single machine, should obtain one with *seven and a half feet rods* and single pulley block. The single rope with cross-bar and handles has been found most suitable for the exercises described, from the fact that the simultaneous movement of the arms acts more powerfully upon the chest than the alternating motions which are commonly practiced on the double-rod machines.

The following is a brief description of the exercises recommended :



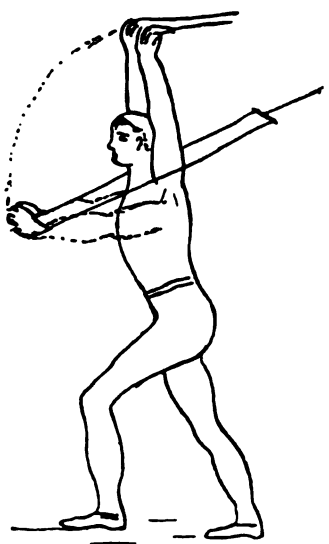
No. 1.

Stand with back to machine, one foot well forward and head and shoulders thrown well back. Holding handles with palms forward and about twelve inches in front of the hips, allow the arms, by a lateral movement, to go upward and away from the side and to the highest point above the head. As the arms move upward, inhale deeply, and as they return to the first position, exhale forcibly. Repeat this a few times, and then take a long breath and hold it during three or four movements. This exercise enlarges the chest laterally.



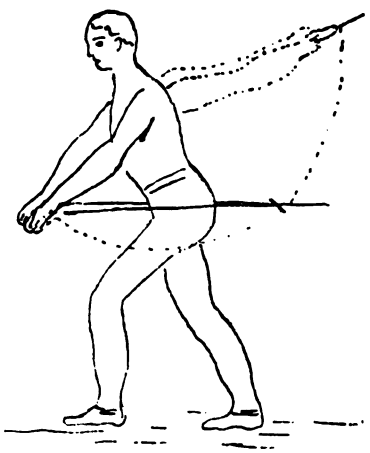
No. 2.

Face to machine. Stand erect with chest out, feet together, and body bent slightly backward. Arms straight above the head, and then downward and backward to a point six inches back of the hips. Take a full breath as the arms go up and exhale forcibly as they descend. Enlarges lower chest laterally.



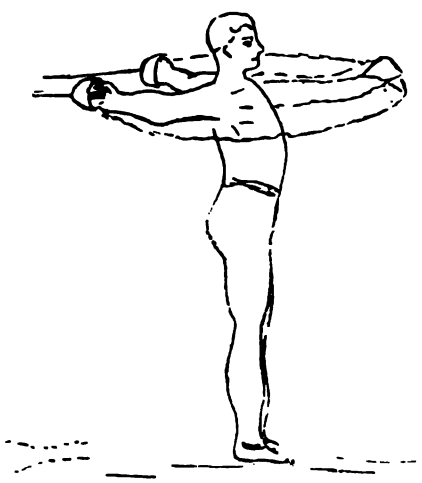
No. 3.

Stand as in position No. 1. Grasp handles of machine, with palms downward and hands about six inches apart. Extend arms directly in front of the body ; then allow them to go upward and backward to a point directly over the head. Breathe in the manner already described. This increases the antero-posterior diameter of the chest.



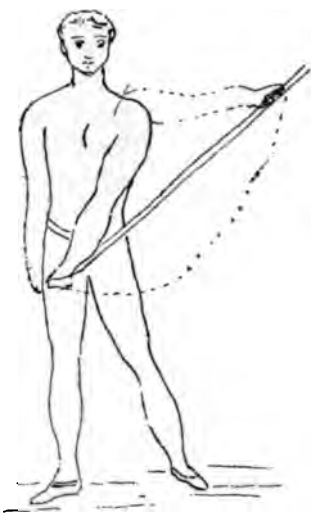
No. 4.

Take the same position as before. Grasping handles with palms looking forward, carry them about eighteen inches in front of the hips; then allow them to go backward as far as is possible without permitting the arms to spread apart behind the back. Breathe as before. This exercise produces results similar to No. 3.



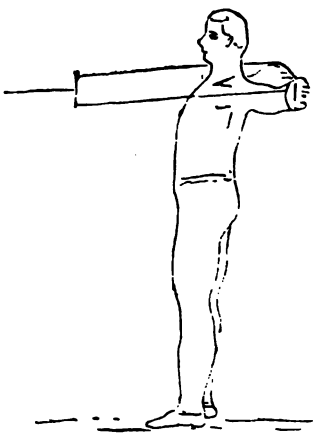
No. 5.

Stand with back to chest weights. Handles grasped with palms looking inward. Arms extended directly in front of the body. Allow arms to swing directly backward, describing arc of a circle and being held exactly on a line with the shoulders. Reverse the movement from this back to first position. The breathing to be practiced as before directed. This expands the chest, straightens the shoulders, and enlarges the muscles of the latter.



No. 6.

Stand with side to machine. Grasp both handles in one hand, with arm extended on a level with the shoulders. Carry the arm downward and directly across the chest, taking a long breath as it returns to a horizontal position. This movement increases the fullness of the chest by developing the pectoral muscles.



No. 7.

Stand facing the weights. Then practice the same movement as described in No. 5. This exercise not only expands the chest, but strengthens the muscles which sustain and straighten the shoulders.

In practicing the first five, particularly, the chest should be thrown well forward and held there. The arms should be kept perfectly straight and not allowed to bend at the elbows. To obviate the undue strain in the small of the back, one leg should be carried well backward. These movements should be made at the rate of from thirty to forty times a minute. Bear in mind that the breathing exercises form an essential part of all the chest movements. The latter must be supplemented by the internal and outward pressure which deep inhalations produce.

Use weights sufficiently light to enable you to practice each movement for at least five minutes without fatigue. Any undue exhaustion or sense of fatigue or strain indicates an improper use of the apparatus.

Begin with exercise No. 1 and go through the series in the order set forth. As you become accustomed to the work, increase the duration of the same. A half-hour night and morning is a fair allowance for the ordinary person. A half-hour three times a day, however, will give better results.

Do not expect prompt and immediate returns from this or any other system of exercise. Physical growth is almost as slow as mental development, and it requires as long a time to attain physical excellence as to master a science.

Measurements of the chest should be taken every six months, at least, in order that the amount and rapidity of development may be determined. In cases where the training has been begun at about the age of maturity, the limit of development will probably be attained in about three or four years. The minimum degree of chest expansion, compatible with health, is two and one half inches; yet no one should be satisfied with less than four. Careful and persistent exercisers often attain six or eight inches. These results when once acquired are comparatively easy to maintain.

While the varied results of physical training are to be attained at any time prior to middle age, yet the degree of development bears a close relationship to the age of the individual. After the age of fifty, for example, very little increase of lung capacity can be expected; yet even here, I have noted a decided improvement in the contour of the chest, as well as the acquirement of increased respiratory power. It is during childhood, however, that the greatest successes of physical culture are to be noted, and it is not difficult to understand why this should be the case. All the conditions are at that time favorable for development. The bones and cartilages forming the framework of the chest contain a minimum amount of earthy material, and consequently are extremely pliable. The muscles are undergoing a formative process, and consequently are readily responsive to stimulus and capable of attaining a higher degree of development than at any other time.

The following table, compiled by Roberts, shows excellently well the progressive increase in the circumference of the chest as it occurs normally and without the aid of gymnastic exercises:

AGE.	CHEST GIRTH.	Annual Rate of Growth.
Years.	Inches.	Inches.
10	23.77	0.50
11	24.33	0.56
12	24.81	0.48
13	26.30	1.49
14	28.18	1.88
15	29.70	1.52
16	31.19	1.49
17	32.80	1.71
18	34.03	1.23
19	34.76	0.73
20	35.13	0.37
21	35.42	0.29

Here it is shown that, although there occurs a progressive growth from early childhood, the greatest increase takes place between the thirteenth and eighteenth years. The increase in height and weight, however, is noted for several years longer. There are other observers who maintain that the lung capacity is increased from the fifteenth to the thirty-fifth year, and at the rate of five cubic inches a year, while after the latter age it diminishes about one and a half cubic inches a year.

Sex exercises some little effect upon growth and development. The investigations of Bowditch have shown that until the age of eleven or twelve years boys are both taller and heavier than girls of the same age. At this period, girls begin to grow rapidly and surpass boys of the same age in both these particulars. Boys afterwards acquire and retain a size superior to that of girls, who have now completed their full growth.

The period of greatest growth is, as a rule, the one most favorable for lung expansion. Hence it follows that between the ages of ten and twenty-five years there is an important interval during which physical development of all kinds may be attained in its greatest degree and with the least labor on the part of the individual. The chest girth of 35.42 inches, as given in the above table, is therefore much less than might have been attained had proper chest exercise been employed during the period indicated.

The age at which such exercises should be undertaken depends

of course upon the condition and surroundings of the individual. Up to ten years or thereabouts, a free, active, out-door life, together with such suitable exercises as the schools *should* afford, would be amply sufficient. Unfortunately, physical training as ordinarily employed there, is a mere farce and scarcely worthy the name. The idea that ten or fifteen minutes of light gymnastics daily is sufficient to strengthen the muscles, straighten the shoulders, and develop the chest, is manifestly absurd. One can hardly expect to counteract in a few minutes those influences which are at work from morning till night, or to overcome in a moment physical defects which have existed for years, and perhaps from infancy.

Physical education is deserving of as much recognition in our public schools as any other branch of learning, and not until this fact is realized can we hope to obtain for our children all the essentials of good health and longevity.

Calisthenics, as ordinarily practiced, are, as I have stated, of too trivial a character to produce any very marked results. By allowing children the use of wands or wooden dumb-bells varying in weight from a half to one pound, their work is rendered more interesting, and at the same time the improvement in muscular development and conformation of the chest is much more apparent. It may be stated just here that dumb-bells, as employed in youth and adult life, are much too heavy. It is seldom expedient to go above five pounds, — a weight which will enable one to practice the various exercises for a long time without fatigue. As true chest developers, however, they do not compare for a moment with the weights, for although by their use the chest girth is generally increased, this is most often due to the development of the muscles on the outside of the trunk rather than to increase of lung capacity. The results, therefore, are more apparent than real.

The duration also of these school exercises should be increased. Twenty minutes' work during each of the two daily sessions is not too long, but would produce results far greater and more satisfactory than any heretofore observed.

After the age of ten or twelve years, there begins another period which is perhaps more important from a physical point of view than the one preceding it. At this time specific exercises should

be instituted for securing lung development. The methods for attaining this object have, I trust, been sufficiently well described. To those who can afford it, — and there are very few who cannot, — the chest weight offers the most efficient aid. It should be placed in every home in the land where children are, and its daily, routine use should be encouraged and, if necessary, insisted upon. It may at times prove a difficult task to persuade young persons to continue the work they have begun, yet after a habit becomes established, its importance appreciated, and its good effects recognized, all reluctance will most likely disappear.

The object of this paper is the promotion of physical culture, not simply for the improvement of the body or figure, or for purposes of competition, but for the reason that it is one of the chief measures for preventing chronic disease of the lungs.

I have endeavored to show that to be most effective, it must be instituted in early life and maintained by proper means through subsequent years. Whatever may be the real cause of consumption, it has been fully established that the well developed lung invariably escapes infection, while the unexpanded one is the first to suffer. Could our educators be convinced of the vital importance of this subject, and be induced to act accordingly, the number of deaths from this disease would be materially lessened, while the capacity for study and for physical endurance would be as greatly increased. During school life the question of the child's future welfare is often decided. It is in the power of parents and teachers to secure for him either a phenomenal brain with a consumptive tendency, or a well developed mind with physical perfection. Now, which shall it be?

AMERICAN PUBLIC HEALTH ASSOCIATION.

SIXTEENTH ANNUAL MEETING.

REPORTED BY G. P. CONN, M. D., DELEGATE FROM THE NEW HAMPSHIRE STATE BOARD OF HEALTH.

The sixteenth annual meeting of this association was convened in the city of Milwaukee, Wisconsin, November 20, 1888, and two regular sessions were held during each of the three following days, besides special meetings, committee work, etc., etc.

This association is one of the most important, influential, and extensive organizations of its kind in this country, as among its members are residents of every State in the Union ; and the dominion of Canada being in full fellowship, the work of the association becomes international in its character. The work of the association is entirely sanitary in its purpose, the prevention of disease, the prolongation of life and health, and the removal of the products of death and decay taking precedence over all other subjects. Sectional lines have no part in the discussions except so far as they may mark the probable limits of some special disease like yellow fever.

It is a well-established fact that ordinary epidemic and contagious disease has no respect for territorial limitations or municipal boundaries ; therefore, health laws and regulations governing the sanitary conditions of towns and cities of the same or similar population, drainage facilities, and water supply, will obtain in any part of the State or country. Thus associated effort becomes

simplified, and the mingling of ideas developed from the study of sanitary problems evolved in New England may become useful on the Pacific coast, and the experience of Canada during the late epidemic of small-pox may assist the health officer in the new States of Dakota or Washington more effectually to stamp out the loathsome disease should it appear to him early in his work. The laws of health are generally uniform, and any serious violation must and will, sooner or later, be accounted for.

No amount of sophistry will cover up the violence done to the mind and the body. A strong physical organization and will power may temporize and extend the period of retribution, but the payment is only postponed. The principal remains the same; the interest is accruing, and bankruptcy stares in the face him who heeds it not.

The associated work of this organization extends through the length and breadth of the land, and has an educational power second only to the individual work of a well organized state board of health. It is worthy of the support of state and municipal health officers, and to attend its meetings should be the ambition of all engaged in sanitary work.

The program for the first session of the association contained the following papers:

"Report of the Committee on the Pollution of Water Supply," by Dr. Charles Smart, surgeon United States Army.

Papers on "Are Small Lakes Fit Sources of Municipal Water Supply?" and "The Effects Produced upon the Waters of Lake Monona by the Receipt of the Sewage of Madison for Six Years," by Prof. W. W. Daniels, Madison, Wis.

The report of Major Smart was one of the best and most timely papers that could have been presented to the association, and one of infinite importance to the public; for a polluted water supply is always unsafe, and a constant menace to the health of a community. A brief abstract is appended, but the report was ordered printed, and your Board of Health is prepared to furnish the full report to those interested in this subject.

Dr. Smart's report contained many statements which will be of local interest. He stated that in every city where records were kept, the death rate from typhoid fever was in direct proportion to the amount of sewage which entered its water supply,

and also that it had been conclusively demonstrated that the condition of a city's water supply has more to do with the prevention and cause of typhus and similar diseases than the condition of its sewerage system. In New Orleans, where rain water is largely used for domestic purposes, there is very little typhus, although that city has no sewerage system at all. Dr. Smart considers the temporary storage of water in reservoirs a good thing. In St. Louis the sediment which collects in the reservoirs amounts to about 200,000 cubic yards annually, which, if the water were not allowed to stand and settle, would be distributed among the consumers. No form of artificial filtration yet discovered can be called a success, because they all fail in their aim to accomplish in an hour the purification which it takes nature months to bring about. Major Smart therefore held with the English authorities: "Rivers which have received sewage, even if that sewage has been 'purified' before its discharge, are not safe sources of potable water."

The whole matter was summed up in the following words: "Reduced to its lowest and simplest terms the question of water supply is this: the raising of sufficient money to bring in the wholesome water, and the investment of the health officer with power to preserve the wholesome quality of the public supply, and to prevent the use of water from sources which are known to be unwholesome." It was also shown that Massachusetts, Illinois, and Minnesota had made wholesome legislative progress in this direction, the state boards of health being empowered not only to act in an advisory and hortatory capacity, but furnished the means by which frequent chemical and biological examinations of the water-shed and basin supplies are tested; and also the power to secure the stoppage and prevention of their pollution, whether actually begun or only threatened, by prompt injunctions from the respective supreme courts.

Drs. Vaughan, Rauch, Horsch, Hicks, Walcott, Rohé, and others joined in an exhaustive discussion of all the vital matters involved in this report, in such a manner as to amplify, corroborate, and indorse it throughout.

Prof. Daniels not being present, his paper was passed for the time, and the whole session was occupied very profitably in the discussion of the paper on water pollution.

EVENING SESSION.

The time of the evening session of the first day was occupied by the usual greetings on the part of the city government, which were followed by the president's address.

The first portion of President Hewitt's address was devoted principally to the power delegated to local health boards, and how it can best be used. The second portion of the address was devoted to a running discussion of certain of the more obvious aspects of public sanitation. There was especial stress laid upon the need of a daily, practical, and, so to speak, petty activity of health officers; so that by clearing away minor abuses one by one, and preparing for larger exigencies by forefending detail work, panics may be avoided at critical times, if, indeed, it be not possible by such "forehandedness" to forestall the crisis itself. Several excellent practical suggestions were also made in regard to this very detail work itself, regarding the fuller, more efficient and instructive handling of vital statistics; the providing for proper isolation and refuge in the case of "catching" diseases; simple, cheap, common-sense devices for disinfection and ventilation, and the crying need of preventive sanitation in behalf of young children, whom modern society, in the hamlet as well as the metropolis, slaughters far more effectually than Herod succeeded in doing. Referring briefly to the paper of the morning, the speaker dwelt on the criminality of water-supply contamination, pointed out the impotency of the chemical decomposition of sewage, and approved of the disposition of garbage by cremation, a process being more and more perfected at present. A deserved compliment was paid to the health authorities of Massachusetts for the advanced state of their work; and among the most efficient methods pointed out the fact that greater and better results were in many, if not in most, instances achievable with individuals, corporations, communities, and legislative bodies by force of enlightenment and suasion than by the infliction of penalties. In conclusion the president's address treated exhaustively of the need of a more intelligent and far-seeing co-operation and independence of local, state, and national health boards, insisting that the first was the integral unit, and that the last should properly be evolved out of the demonstrated and experienced needs

of the second. In other words, that the highest efficiency of local boards, rural as well as urban, is of the last consequence, and that the true function of the national board should, on the one hand, be to facilitate and cement the interdependent helpfulness of the state boards among one another, and, secondly, to provide for a thorough extra-national system of sanitary inspection in connection with our consular system. This portion of the address will be sure to provoke lively discussion as soon as its subject matter can be properly referred to in the consideration of the late yellow fever epidemic and the inefficiency of our system of international and interstate quarantines.

The program for the first session of the second day embraced the following papers:

Paper on "Remarks on the Classification of Diseases," by Henry B. Baker, M. D., secretary of the Michigan State Board of Health.

Paper on "Yellow Fever; Panics and Useless Quarantines; Its Limitation by Temperature," by John H. Rauch, M. D., secretary of the State Board of Health of Illinois.

Paper on "Memoranda of Visits to the Quarantine Stations of the Atlantic Coast, Made During the Summer of 1888," by Benjamin Lee, M. D., secretary of the State Board of Health of Pennsylvania.

The paper by Dr. Baker was an exhaustive report on the classification of diseases, and a valuable and interesting *resumé* to those who have such work to do.

Dr. Rauch devoted considerable time to panics and useless quarantines, as they were instituted at the South during the year 1888, and referred incidentally to his own work during the epidemic, as well as to the useless suggestions that were brought before the public. The impotence of Congress, which offered a $100,000 prize for a cure for yellow fever, instead of providing for an efficient national board of health, was sharply castigated in a neat aside; and he boldly avowed himself as having acted in the interests of the Illinois Central road during the late panic over the yellow fever epidemic. "And of all other business interests," the doctor added. For he showed clearly that with his finger on the thermometric pulse, no man in his position need place any barrier in the way of the freest commercial

intercourse with fever-stricken communities so long as the mean temperature of his own remained below seventy degrees. The heartless, senseless brutalities of the "shot-gun quarantines" were in this connection made as manifest as was the criminal culpability of those Florida municipal and so-called sanitary authorties who for weeks suppressed, as did even the Marine Hospital Service "from business considerations," all information that Yellow Jack had found a lodgment in the United States. Being an exotic disease, its importation should be provided against by the most careful expert consular espionage, and kept out by rationally efficient and cool-headed coast quarantines, such as that at New Orleans. What fear is to the individual, that panic is to the community, a debilitant and predisposer to epidemic influences. Hence, if despite all extra-national and coast quarantine precautions an epidemic disease like yellow fever, cholera, or small-pox enters our borders, it is of the last importance that absolutely frank and accurate publicity be promptly and authoritatively given to the facts such as they are; and that efficient and harmonious co-operation prevail among the various state boards of health.

The paper by Dr. Benjamin Lee, of Philadelphia, was, in that gentleman's unavoidable absence, read by Dr. George H. Rohé, of Baltimore. It comprised a series of synoptical memoranda of actual and personal observations made at various quarantine stations along the Atlantic coast, including those of New York, with a $2,000,000 plant fallen into dilapidated neglect and hampered by antiquated and inadequate methods because resting under the curse of political spoils-grabbing and assessments, owing to the enormous income from fees and fines attached to the office; of Philadelphia, abutting on a sewer-polluted marsh; of Baltimore, situated too near the city and lacking proper means for disinfection; those of Norfolk, Cape Charles, and Wilmington, — one and all but sanitary sepulchres not even whited for appearance' sake. From these observations Dr. Lee has derived the following critical estimate of the entire system:

"1. Want of uniformity in quarantine regulations placing one port at a disadvantage, either commercially or sanatively, as compared with another.

"2. Conflict of authority, owing to the methods of appointing officers.

"3. Entire lack of appreciation on the part of local legislatures, whether state or municipal, of the importance of the expenditure of considerable amounts of money in order to render quarantines at once efficient and inoppressive.

"4. Tendency on the part of local civic and sanitary authorities to limit their responsibility to the protection of their own city, reckless of the consequences which may ensue to inland communities if they permit infection, which circumstances render harmless to themselves, to pass unchallenged to the latter."

This was followed by a voluntary paper by Crosby Gray, health officer of Pittsburg, Penn., on the contamination of that city's south side water supply by surface drainage. This paper, in a very interesting form, gave the results of a very careful topographical, chemical, and biological examination into the general causes of a 6-per-cent higher death rate on this said south side than obtains in the remaining portions of the city, and as to the origin in particular of last winter's virulent and widespread typhoid epidemic in that territory. These investigations proved to a demonstration that the water supply drawn from the Monongahela was being seriously polluted by sewage, factory refuse, and by other nuisances, and that the epidemic in question had been caused by the sudden downwash, through rainwater surface drainage, of typhoid excrements from certain gulleys far above the in-take — the disease having for some time been endemic in those localities, in a small way. In his recommendations he said :

"The cash value of a human life to a community has often been computed, and it is a moderate estimate of the average value of the 260 lives lost on the south side over and above its just percentage of the current death rate in Pittsburg, at $1,275 each, or $331,500 together. To this should be added the burial expenses at $50, or $13,000 in all. But, as for every death there are many ill who recover, it would be a juster estimate to capitalize the sick at ten times that of the death rate. That would mean 2,600 people ill. The average time these people would be compelled to remain unemployed would be say thirty days. This would give us 78,000 days' work lost. From this deduct 15 per

cent for those below the productive period of life, which would leave 66,300 days lost. Averaging the value of a day's work at $1.25, the total loss in productivity would be $82,875. Add a quarter to this sum, on the basis of but 31 cents per day for otherwise productive time devoted to nursing, etc., that amounts to $20,718 more; to which should be added certainly not less than $2 per case for medicine, i. e., $5,200 more. And finally there should not be forgotten the legitimate profit (of, say, one third a day's wages) on its putative product, to wit, all of $27,625 more. These amounts tally $480,918 per annum, which literally fatal waste might be stopped once for all by the establishment of an improved water service drawing its supply from unpolluted sources one hundred miles off, by the timely and wise investment of this sum for two or three years."

No disposition was shown to gainsay either the substantial accuracy of the estimates, or the soundness of the conclusion. For if the ratio of illness to death be thought too high at ten, and the average loss of time on that account held to be probably less than thirty days, it will not escape the notice of attentive readers, any more than it did that of Health Officer Gray's auditors, that no provision at all was made in the computation for "professional charges," whether through oversight or because of an altogether laudable anxiety to keep the figures within the bounds of seeming reason, does not appear.

AFTERNOON SESSION.

During the intermission, the members were taken for a drive about town, embracing a grand tour of the east and west sides of the city, and it was about half-past four when they returned, well pleased with the excursion.

The afternoon's program contained three papers:

Paper on "The Canadian System of Maritime Sanitation," by F. Montizambert, M. D., quarantine officer at Grosse Isle, St. Lawrence river.

Paper on "The Quarantine System of Louisiana, and its Improvement," by Lucien F. Salomon, M. D., secretary State Board of Health of Louisiana.

Paper on "Garbage Furnaces and the Destruction of Organic Matter by Fire," by S. S. Kilvington, M. D., president of the Minneapolis board of health.

The first paper gave a detailed account of the superior equipment on land and on water, for the expeditious and thorough disposition of and care for immigrants at the model station on Grosse Isle, and for the scientifically and mechanically perfect appliances for disinfecting craft. This paper was illustrated by a score or more of stereopticon views, during the demonstration of which the debate became quite animated, the contention being as to whether the sulphurous acid gas were better generated by combustion in the hold, or forced into it as a saturate fume by turbine fan action.

Dr. Salomon gave a brief history of the development in efficiency of the Crescent City station, and made report of the improvements in location, facilities, and equipment that the same would soon be able to boast of. New Orleans is evidently intent upon reassuring its waterway commercial neighbors and dependents on the Gulf and in the Mississippi valley. Dr. Durgin rendered an eminently satisfactory account of the simple and sensible, though somewhat old-fashioned, methods in vogue at the port of Boston.

Finally, Dr. S. S. Kilvington, of Minneapolis, read a paper which characterized the present as the era of filth formation, and which strongly advocated the sanitary necessity of an old-fashioned Gehenna for every modern city. It was, as flatteringly described by Health Officer De Wolf, of Chicago, the most exhaustive and helpful disquisition yet compiled and worked out on the subject of garbage cremation. After giving a careful historical retrospect, followed by a brief enumeration of the various practical experiments made, chiefly in England, during the past decade, Dr. Kilvington gave a detailed and instructively illustrated description of the four crematories now in reasonably successful operation in this country, dwelling on the chief merits and defects of each. This made the association fully acquainted with the Forrestal crematory, of Milwaukee; with the Ryder, in Pittsburg; the Mann in Montreal and Chicago, and the Engel, which, after having been perfected in Minneapolis, has come into

use at Des Moines and Coney Island, and is even now being substituted by Contractor Forrestal for his old one heretofore in use which, as will be remembered, was planned by Dr. Marden.

The evening session was given up, in order that the members might attend a reception given by the Ladies' Club, of Milwaukee. This was held in the Atheneum building, which is owned and controlled by a syndicate of the ladies from this club, and is an institution of which they are justly proud and one that might well be duplicated in every city of fifteen or twenty thousand inhabitants, for it fills a place in educational and amusement circles that leads to refinement and to the elevation of mental and moral sentiment.

As the guests came in they were received by a reception committee consisting of Mr. and Mrs. W. P. McLaren, Mr. and Mrs. W. G. Fitch, Mr. and Mrs. John Johnston, Dr. and Mrs. Marks, Dr. and Mrs. Fox, and Mr. and Mrs. J. S. Peck. Almost every one of the visitors was present, and the evening was spent in social conversation and inspection of the building. An orchestra in the hall above furnished music, and refreshments were served in the supper rooms.

The morning session Thursday had the following program:

Paper on "The History and Administration of Quarantine in Texas, 1887 to 1888," by R. Rutherford, health officer of Texas.

Paper on "The Outbreak of Yellow Fever at Jackson, Miss., in September, 1888," by Dr. Wirt Johnston, secretary of Mississippi State Board of Health.

Paper on "The Problems of Yellow Fever Epidemics," by Dr. Jerome Cochran, state health officer of Alabama.

Paper on "Some Personal Observations on Yellow Fever and its Habitudes, as opposed to the Fallacies and Dangers of Personal Quarantine," by Dr. A. N. Bell, Brooklyn, N. Y.

Paper on "Sanitation in St. Paul," and "Proposed Plan for the Disposition of Night Soil, Garbage, etc., at St. Paul, Minn.," by Dr. H. F. Hoyt, health officer of St. Paul.

The paper by Dr. Cochran was read first and attracted great and deserved attention. Though requiring nearly three quarters of an hour for the delivery of his address, and though making no pretense whatever to rhetorical elaboration or verbal finish, — for it was not, indeed, committed to writing until after the doctor's

arrival in Milwaukee, and was, moreover, read *prima vista*, without any revision, — it held the undivided attention of every auditor, from its opening paragraph to its closing sentence, and was unaninously ordered printed for prompt dissemination among the state and local health officers throughout the Union, especially south of the febrile Mason and Dixon's line, as a practical, educative tract. It is doubtless the most important and instructive paper of this year's session, and it was very delicately complimented by Colonel Hadden, who suggested that the best method of discussing the same would be to have it re-read.

In summing up he had this to say about yellow fever: "This disease is caused by a transportable and transmissible poison quite as specific as prussic acid, for instance; but it is not known whether the same be a living organism, similar to the cholera microbe, or, as seems more probable, the product of some *quasi* fermentative process like that caused by the yeast fungus, which in feeding on sugar decomposes it into alcohol, carbonic acid, and water. These germs do not appear to be bacteria of generically distinctive character or kind, the probabilities pointing rather to a pathologically productive condition of the flora ordinarily resident in the alimentary canal. It is infectious and, moreover, communicable, but whether from the patient's respirations, secretions, or excrements, is unknown, as is also its route of ingress into the human organism, whether from the skin, by inspiration, or alimentation. Though this point is also not yet quite certainly determined, it is more than probable that not personal contact but the immediate environment, as is the case in typhus and cholera, produces the infection. It is in the United States, however, always of exotic origin; and, as in the case of a shower of sparks on a shingle roof, it is but one, perhaps, that will set fire to the building. Yet one or two sporadic cases are very unlikely, if properly handled, to produce an epidemic, even under otherwise unfavorable conditions. For it may be laid down as a general proposition, that in order to get across the street or over a wall, this infectious 'what-is-it' must be lugged there, as it were, by hand or in a bundle. Thus jails, convents, and secluded private domiciles are demonstrated to be their own best quarantines. From this it is made clear that whatever else may be true, so much is undeniable, non-intercourse is the best

prophylactic in latitudes and at seasons where and when the daily mean temperature is protractedly 70 degrees or over. In other words, the golden rule is: "Don't go near the fever if you don't wish to catch it," and its corollary, self-evidently quite as sound, "Don't let the fever come near you, if you don't wish it to catch you" — but only, be it remembered, in latitudes and at seasons where and when the daily mean temperature is protractedly 70 degrees or over. From all of which it further follows that domiciliary quarantine, prompt and perfect, is the desideratum, followed in due course by thorough disinfection. On the other hand, it is also certain that depopulation is infeasible and worse, because it involves stampedes and panic, and these in turn what might be called chaotic quarantining, — unlawful, wasteful, cruel folly. So, too, are refugee camps necessarily of evil, though admirable in theory. Thoroughly competent health officers, few but efficient, should once for all be endowed with ample funds and authority, and then trusted to run the job themselves without the interference of boards of trade or other expert authorities in — other matters. For be it furthermore remembered, that upon importation, even during "hot spells," a spreading of the disease does not follow as a matter of physical or logical necessity, and that in any case its spread, if it spread at all, will be slow. So for this, if for no other reason, it would be advisable to take things easy. If there be a strong, well-equipped health department, all the better; but in any case keep cool."

Such in effect was the discourse; little wonder, therefore, that it was thought by the American Public Health Association, in annual meeting assembled, that if the prompt and persistent dissemination of these plain facts and this sound advice could be effected by the press and the profession among the people of all classes throughout the South, it would do even more good than if the unexpected were to happen, and Congress provide a thorough and efficient system of international and interstate co-operation in mutual protection against infectious diseases.

OTHER PAPERS ON THE SAME SUBJECT.

Supplementary to this disquisition, there were read three papers dealing with the same subject from different or more restricted

standpoints. Dr. A. N. Bell gave it as his conviction, resultant from an intimate study of the disease in the semi-tropics about the Spanish main and in quarantine at New York, that the disease is not infectious except through things and places, and then only under predisposing atmospheric conditions.

Health Officer Rutherford, of Houston, Texas, read the history of the Texas quarantine administration for the past ten years, which bristled with names and figures.

Dr. Rauch also read the record of eleven cases, only one of which proved fatal, at Jackson, Miss., all the patients being either builders on or watchmen about the new Illinois Central depot near their old freight house in Jackson, Miss. Though scattered far apart, all about town, these cases did not infect the community, however they themselves may have been infected — presumably by non-disinfected cars stalled near the site of their work, in which they may have taken their nooning.

It was left to Colonel Hadden, of Memphis, to sum up the entire subject as involved in the series of papers and brief discussions on yellow fever and quarantining, in a most happy, off-hand, and non-technical way. This gentleman of the old school proceeded to give his experience as the very head and front of a so-called shot-gun quarantine, in a manner that simply convulsed his audience.

Dr. H. F. Hoyt, health officer of one of the largest cities in Minnesota, metaphorically robbed Peter to pay Paul, when he repeated the truism that physically St. Paul was builded on a rock; and then he went on to show that despite herculean labors but 7,200 householders of that city had, as yet, tapped her water-mains, while only 4,500 had connected their domiciles with the city sewers.

Prof. W. W. Payne, signal service officer at Northfield, Minn., then briefly requested an intelligent co-operation between health officers and the service, to the end that by the graphic compilation of "weather" and "health" data the possible, not to say probable, connection between the two as cause and effect, may in good time be authoritatively either demonstrated or disproved.

And finally, Dr. A. N. Bell presented a brief report from the committee on sanitary and medical service on immigrant ships, which on the one hand showed up the shamelessly systematic

evasions of the Turner law on this subject, and on the other proposed remedying its deficient and defective provisions by due amendment.

EVENING SESSION. — EIGHT O'CLOCK.

Paper on "Tuberculosis, its Origin, Detection, and Control," by D. E. Salmon, D. V. M., chief of the Bureau of Animal Industry, Washington, D. C.

Paper on "Some Observations on the Origin and Sources of Disease Germs," by Theobald Smith, M. D., of the bacteriological laboratory of the Bureau of Animal Industry, Washington, D. C.

Paper on "Meteorological Observations as respects Disease Prevalence," by Prof. W. W. Payne, director of the observatory, Northfield, Minn.

Dr. D. E. Salmon, with the aid of the stereopticon, showed the bacillus latterly assumed to be the cause of, as it certainly is the concomitant characteristic of, tuberculosis in human as well as animal organisms. The subject was invested with interest from the fact that 131,000 is the computed mortality from what is termed "consumption" during the current year in the United States. While technically precise and scientifically accurate throughout, the doctor's paper yet treated the subject in a popularly instructive manner. The bacillus was shown to enter the human organism not by direct transference from one person to another, but on the one hand through the air and water we all consume, surcharged as they are with the dust of human and animal secretions and excretions, and on the other by much of the beef and milk that despite its infected condition finds a ready market. Little hope was held out for the attainment of even a measurable control of the disease except by stamping it out in cattle.

Dr. Theobald Smith's paper had evidently been compiled with much erudition, and some of the deductions made seemed to furnish very plausible and helpful working theories for bacteriologists.

Chairman C. A. Lindsley, of the Lomb prize committee, announced the award of the first prize, $500, to that essay on hygienic dietetics superscribed with the motto "Five Food Principles, Illus-

trated by Practical Recipes." On opening the sealed envelope, it was found that the successful author was Mary Hinman Abel, wife of Dr. John J. Abel, now resident at Strasburg, Germany, where husband and wife are attending the university. The second prize was not awarded.

FRIDAY, NOVEMBER 23.

The closing meeting of the association was mainly given to routine work. Reports from special committees were heard and acted upon, and the report of the advisory council was adopted, the following officers being elected: President, H. A. Johnson, M. D., Chicago; vice-presidents, Jerome Cochran, M. D., Mobile, and F. Montizambert, M. D., Quebec; secretary, I. A. Watson, M. D., Concord, N. H.; treasurer, J. Berrien Lindsley, M. D., Nashville, Tenn.

Adjourned to meet in Brooklyn, N. Y., on Tuesday, October 22, 1889.

POISONOUS WALL-PAPER.

A few suspected cases of poisoning from arsenical wall-paper were reported to the board during the year. One case came to the knowledge of Prof. E. R. Angell, who communicated the facts and also transmitted a sample of the paper. The following is a copy of his letter regarding this case:

DERRY, N. H., April 6, 1889.

Dr. Watson:

DEAR SIR, — This piece of wall-paper inclosed contains arsenic at the rate of 2.96 grains per square yard. A neighbor's house has several rooms papered with it. His daughter has been complaining for some time of not feeling well, a difficulty of the throat and other ill feelings. His daughter keeps house for him and is the only person who remains in the house most of the time, and her sleeping-room is papered with the same.

Finally they became convinced that the paper might be the cause of her illness. From the results obtained there can be no doubt that the suspicion was rightly placed. I presume there are many instances of ill-heath from the same cause throughout the State, if any one knew where to look for them I suppose many fabrics, calicoes, etc., contain arsenic.

I wish there might be some way of getting at the kinds of papers and fabrics which are in the market throughout the State and which might be open to suspicion. As a member of the local board of health, I would look up this matter in our town if I were certain it was within the jurisdiction of the board. Have we the right and power to do so?

Yours very truly,

EDMUND R. ANGELL.

A piece of paper taken from the wall of a room occupied by a young lady in this city, who had a suspicion that she might be getting poisonous effects from the paper, was sent to Professor Angell for examination, upon which he reported as follows:

The sample sent contains 0.165 grain of arsenic per square yard. The quantity is so small, I do not know whether it was an intentional addition to the paper coloring matter, or whether that amount might be received from the other materials used in its manufacture. However, the test gives the "eight to pica" line mentioned on page 265, Fifth Annual Report State Board of Health, Lunacy, and Charity, Massachusetts, 1883. I shall keep all the results so they may be compared.

With a view of examining into this subject somewhat further than it has been convenient to do the present year, the secretary collected eight samples of wall-paper from one residence, which must have been put on between five and ten years ago, and twenty samples from the shelves of a retail store in this city, and sent the lot to Prof. Angell for examination. The paper selected from the retail store was from among all grades, and of a great variety of shades and colors. The following is the report rendered by Prof. Angell:

DERRY, N. H., May 25, 1889.

Dr. Watson:

DEAR SIR, — Below you will find report on the papers tested for arsenic:

		Grains per square yard.
No. 1	contains	2.96
2	"	0.16
3	"	1.58
4	"	0.17
5	"	0.39
6	"	1.05
7	"	Trace
8	"	1.85
9	"	0.46
10	"	0.33

Nos. 11 to 30 contain no more per sample that ½ grain per piece of the size 12 yards long and 21 inches wide, the quantity which was thought to be allowable for the arsenic naturally contained in the dyes and chemicals used in printing the papers. No. 30 gave no sublimate in the glass tube, being absolutely free from arsenic.

I send you by this mail the tubes containing the sublimates of the tests from No. 11 to No. 29, except No. 18, which was about the same as No. 24. Each of the tubes is numbered. I also send two tubes, labeled but not numbered, which contain sublimates obtained from a known quantity of arsenic, the same quantity as a piece of paper 4 inches square would contain to make the whole strip (12 yards by 21 inches) contain just ½ grain. By comparing the tubes you can readily see that the tubes from the paper tests indicate no more arsenic, some of them very much less.

Yours very truly,

EDMUND R. ANGELL.

It will be seen from the above that the samples (Nos. 3 to 10 inclusive) obtained from the residence referred to, all contained arsenic in varying quantities, while the samples (Nos. 11 to 30 inclusive) obtained at the retail store contained but a trace of this poison.

These examinations are, of course, very limited, and hence no inference of value can be drawn, although it suggests that possibly there is now much less arsenical paper in the market than formerly. The reports that have been made in other States upon this subject doubtless have induced some manufacturers to seek a less dangerous substitute.

The American Pharmaceutical Association took up the subject at its last meeting, and it was considered of sufficient importance to refer it to the American Public Health Association, that steps might be taken to secure the proper legislation.

The following is from the transactions of the American Pharmaceutical Association, advance sheets of which were forwarded to this board:

ARSENIC IN WALL-PAPER.

QUERY No. 39. — In what quantity and to what extent is arsenic present in wall-paper? Is the public health thereby in any degree affected?

BY D. H. GALLOWAY.

A large number of samples of wall-paper were obtained from many different sources, paper-hangers, stores, imported samples,

and from friends, those from the latter being papers already upon their walls or about to be put on.

I made a determination of the arsenic in 100 samples. These samples were taken at random, and included all colors, styles, figures, and prices, the latter ranging from four cents to two dollars per roll, and some that were sold by the yard at a much higher price.

When I began this work, nearly a year ago, I supposed that after a time I should be able to tell by appearance whether a paper contained arsenic or not. This expectation has not, however, been realized, and I am now convinced that it is impossible to say, before examination, whether a given sample contains arsenic or not.

The following table gives the amount of arsenic, estimated as As_2O_3 in one square meter of each paper examined:

NUMBERS OF SAMPLES.	As_2O_3 in 1 sq. m.
3, 4, 5, 6, 15, 24, 29, 38, 44, 45, 46, 47, 48, 49, 50, 51, 52, 72, 75, 84, 89, 91, 92, 95, (24)	Free.
23, 28, 30, 37, 39, 42, 43, 57, 62, 69, 70, 71, 76, 78, 85, 86, 87, 88, 90, 93	Trace.
14, 25, 74, 83	1 mg.
73, 84	2 "
10, 33, 66, 67, 82	3 "
22, 63, 65, 99	4 "
54, 55, 59, 61, 96	5 "
13, 26, 32, 40, 53, 64, 68, 97	6 "
77	8 "
17, 18, 20, 21, 31, 34, 58, 98	10 "
36, 60, 79	12 "
11	14 "
7	15 "
41	20 "
1	25 "
26	26 "
15	30 "
2, 56	50 "
19	60 "
35	90 "
9, 81	200 "
100	600 "
27, 80, more than	100 "

Mr. T. N. Jamieson gave me several thousand samples that had been sold to pay duty at the custom house. Twelve of these, picked out at random, showed arsenic in every case, ranging, however, quite low, from 2 to 6 mg. These samples were, presumably, of German manufacture. The uniformity of the amount of arsenic in these papers would seem to indicate that it had been used as an antiseptic in the paste with which the pigment was applied to the paper.

The two samples, 9 and 81, containing 200 mg. each, are probably of the same lot, as the colors are identical, though the figures are quite different.

No. 100 contains an average of about 600 mg. per square meter, the arsenic being almost entirely in the red, a square meter of which, therefore, contains over one gram of arsenious oxide.

No. 56 looks like the same paper, although it contains only about 50 mg.; however, it is difficult to get a fair sample of a pattern containing figures so large and varied.

There is scarcely room for difference of opinion as to the injurious effects of large amounts of arsenic in wall-paper upon those who are exposed to its influence. There is little doubt that the air in rooms papered with arsenical wall-paper becomes contaminated with arseniuretted hydrogen, particularly in damp weather. This gas is extremely poisonous, and, though in very small quantities, sometimes gives rise to most alarming symptoms.

Even if this decomposition did not take place, the air of the room must be filled with arsenic dust, particularly after sweeping and dusting, and thus cause more or less irritation of the eyes, nose, mouth, and throat, similar to the symptoms of catarrh or a cold. Some of it is swallowed with the saliva, giving rise to intestinal and constitutional disturbances of a more or less serious character, as indigestion, nausea, diarrhea, general debility, nervous prostration, etc.

Numbers of cases of fatal poisoning in this manner are on record, as well as many others in which the cause was discovered in time, and on the removal of which the patients recovered. The extreme difficulty of tracing to their proper source symptoms of this character, must be plain to every one. How frequently we hear the diagnosis "general debility," "nervous prostration," "indigestion," etc., the symptoms resisting all treatment until,

perhaps, "rest and a change of air" are prescribed, when recovery follows, the symptoms returning, however, when the patient resumes his former work and environment. That many of these cases are due to arsenic in the wall-paper, there is abundant proof; that there are thousands suffering from this cause, of which they and their physicians are totally ignorant, is a conclusion well warranted by the evidence.

Prof. Edward S. Wood gives (Report Massachusetts Board of Health, 1883) a list of forty-two cases of arsenical poisoning, most of which were due to wall-paper. Prof. Wood mentions a great many other articles in which arsenic has been found; among them are the following: Dress goods, muslins, linen, artificial flowers, curtains, lambrequins, gloves, calico, cloth, boot-linings, paper collars, linen collars (one collar contained 10.4 grs. of As_2O_3), hat linings, colored stockings, linings in baby carriages, bed hangings, colored wax-candles, confectionery, etc., etc.

The presence of arsenic is so widespread that perhaps it would be impossible to exclude it entirely from such articles, but the deliberate use of it as a coloring for such purposes should not be tolerated. An attempt was made in Massachusetts a few years ago to secure the enactment of laws on the subject, placing the limit of arsenic in wall-paper at 7 mg. to each square meter; but the wall-paper manufacturers were too influential with the legislators, and the bill failed to become a law.

There is no excuse for the presence of such quantities of arsenic in wall-papers, as all the colors produced by it can be made by other means, and in view of the helplessness of the average individual in the presence of such an insidious poison, its use as a pigment in all cases should be prohibited by stringent laws. — *Chicago College of Pharmacy.*

Mr. Maisch: I am very glad that such a paper has been presented here, because I consider the subject one of the utmost importance. It has been investigated by chemists and others interested in public health perhaps for the last thirty or forty years, if not longer. I remember the time very well, perhaps some thirty years ago, when it was denied that the presence of arsenic in the coloring matter of wall-papers could possibly have any injurious influence on the health of persons living in rooms where such paper was used, but careful experiments that were then made showed that arsenic is liberated, a volatile compound being formed, very likely arseniuretted hydrogen, which can be

found in the atmosphere of rooms the walls of which are covered with arsenical paper. The amount of such arseniuretted hydrogen liberated is, of course, extremely minute, and it takes a long time for the wall-paper to exert an injurious influence. The larger the quantity of arsenic contained in the coloring matter, of course the more rapidly will arseniuretted hydrogen be evolved and the more injurious will be the atmosphere. On the other hand it must be remembered that arsenic can be detected in extremely minute quantities, and that in many cases it is very difficult to free chemical compounds entirely from the last traces of arsenic. Hence the importance of limiting the quantity of arsenic to be contained in a certain flat space of wall-paper. Whatever influence our association can bring upon the enactment of such laws as are indicated here, I think would be influence very well bestowed, and would in the course of time be appreciated by the public.

Mr. Whelpley: I do not know how much influence this association could have upon legislation prohibiting the use of arsenic in wall-paper, but there is one thing the members of this association can do in furtherance of the object, and that is to examine wall-paper and other substances that have been mentioned, for arsenic; not to wait for customers to bring them to be examined, but to be enterprising enough to obtain samples for examination, and to report to their physicians and customers the result. In that way they will not only elevate the profession in the eyes of the public, but will be opening to themselves a new source of revenue; because if it once becomes known to the physician and the public that such dangers are among them, they will be willing to pay the druggists to determine whether these goods are dangerous or not. The medical journals of the present day report many cases of arsenic poisoning. I think that the druggist should not lose sight of this opportunity to benefit the public and at the same time promote the interests of his own profession. It is a singular fact that the manufacturers claim that there is no arsenic in wall-paper. I have seen circulars issued by wall-paper manufacturers to that effect. The manufacture of wall-paper is one grand trust, and the price of wall-paper is maintained in a manner that is only equalled by the Standard Oil Combination and others of a similar character. They don't hesitate to spend any amount of money issuing circulars and in publishing analyses to show that wall-paper does not contain arsenic; here is your opportunity to lay the difficulty bare before the public.

Mr. Ebert: In Europe, especially in Germany, this matter has been very much more carefully considered and thought of as being of importance than in this country. While studying in Munich we, as students, had the privilege of making such examinations in the laboratory of the chemist for the department of health in that city. Wall-paper, beer, and various articles of food and drink were constantly submitted, and this question of arsenic in wall-paper, in clothing, feathers, ornaments, and other things, was constantly investigated. Although the laws are very rigid, still quite frequently this contamination was ound in samples purchased from stores in the city of Munich. They would be reported to the health department and the goods would be confiscated. I think

if the association would take some steps in that respect it would not be necessary to alarm the public, but laws could be enacted and carried out under the supervision of local boards of health. I do hope that this matter may be deemed to be of sufficient importance to warrant such action, and that the gentleman be asked to continue his researches. Arsenic is contained in some of our foods; for instance, jellies are made out of glucose and are largely colored with analine colors. You will find by testing these jellies that arsenic is present, whether in large quantities or not I don't know, but I know they are contaminated by analine colors which contain arsenic.

Mr. Manning: It needs something besides the state board of health to arouse the public to the danger. In our State, Massachusetts, the state board of health, as alluded to in this paper, has made a very full and complete report. The matter was carried to our legislature, and action was invariably unsupported from the fact that the community are not alive to the danger; they have no thought that there is any danger in this matter. In one city in our State the wife of a very prominent citizen died from arsenic poisoning developed in the manner indicated, which was conclusively proved and believed by the community. In that connection I want to allude to what Professor Whelpley has remarked, and that is the source of revenue that may be derived by the druggist. An analysis was made, and in less than thirty days the analyzer had a large number of analyses to make. But I don't believe the public generally will be moved in this matter unless some such thing as that develops that sentiment.

Mr. Hallberg: I think the American Health Association would take hold of this subject, and I will move that the attention of the American Public Health Association be directed to this matter by sending to its secretary a copy of the paper and discussion, and asking them to take such steps as might secure the proper legislation.

Mr. Hallberg's motion was seconded and adopted.

PRACTICAL SANITARY AND ECONOMIC COOKING.

ADAPTED TO PERSONS OF MODERATE AND SMALL MEANS.

BY MRS. MARY HINMAN ABEL.

THE LOMB PRIZE ESSAY.

Inscription: "The Five Food Principles, Illustrated by Practical Recipes."

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PREFACE.

Perhaps there is no better way of presenting to the public the facts which led to the creation of this valuable work than by inserting the announcement which resulted in the exceedingly lively and able competition for the prize, as well as the merited honor which was certain to fall upon the successful competitor. It read as follows:

AMERICAN PUBLIC HEALTH ASSOCIATION.

THE LOMB PRIZE ESSAYS.

Two Prizes for 1888.

Mr. Henry Lomb, of Rochester, N. Y., now well known to the American public as the originator of the "Lomb Prize Essays," offers, through the American Public Health Association, two prizes for the current year, on the following subject:

PRACTICAL SANITARY AND ECONOMIC COOKING ADAPTED TO PERSONS OF MODERATE AND SMALL MEANS.

First Prize, $500 . . . . . Second Prize, $200.

Judges: Prof. Charles A. Lindsley, New Haven, Conn.; Prof. George H. Rohé, Baltimore, Md.; Prof. Victor C. Vaughan, Ann Arbor, Mich.; Mrs. Ellen H. Richards, Boston, Mass.; Miss Emma C. G. Polson, New Haven, Conn.

Conditions: The arrangement of the essay will be left to the discretion of the author. They are, however, expected to cover, in the broadest and most specific manner, methods of cooking as well as carefully prepared recipes, for three classes,— (1) those of moderate means; (2) those of small means; (3) those who

may be called poor. For each of these classes, recipes for three meals a day for several days in succession should be given, each meal to meet the requirements of the body, and to vary as much as possible from day to day. Formulas for at least twelve dinners, to be carried to the place of work, and mostly eaten cold, to be given. Healthfulness, practical arrangement, low cost, and palatableness should be combined considerations. The object of this work is for the information of the housewife, to whose requirements the average cook-book is ill adapted, as well as to bring to her attention healthful and economic methods and recipes.

All essays written for the above prizes must be in the hands of the secretary, Dr. Irving A. Watson, Concord, N. H., on or before September 15, 1888. Each essay must bear a motto, and have accompanying it a securely sealed envelope containing the author's name and address, with the same motto upon the outside of the envelope.

After the prize essays have been determined upon, the envelopes bearing the mottoes corresponding to the prize essays will be opened, and the awards made to the persons whose names are found within them. The remaining envelopes, unless the corresponding essays are reclaimed by the authors or their representatives within thirty days after publication of the awards, will be destroyed, unopened, by the secretary.

None of the judges will be allowed to compete for a prize.

The judges will announce the awards at the annual meeting of the American Public Health Association, 1888.

It is intended that the above essays shall be essentially American in their character and application, and this will be considered by the judges as an especial merit.

Competition is open to authors of any nationality, but all the papers must be in the English language.

IRVING A. WATSON,
Secretary.

CONCORD, N. H., February, 1888.

The above circular was extensively distributed and published throughout the United States and the Dominion of Canada, with the result of bringing to the secretary, within the specified time, seventy essays upon the subject announced. The arrival of

these essays covered a period of nearly five months, and they were forwarded to the chairman of the committee of award nearly as fast as received, thus giving the committee ample time for their exceedingly laborious work of examination. The decision of the judges was announced at the sixteenth annual meeting of the American Public Health Association, and was as follows:

REPORT OF COMMITTEE ON THE LOMB PRIZES.

Your committee, to whom were referred the essays upon "Practical Sanitary and Economic Cooking adapted to Persons of Moderate and Small Means," respectfully report that they have perused with thoughtful and considerate attention the three score and ten essays which were submitted to them.

A few of them were presented in beautiful specimens of typewriting, but the great majority of them were in manuscript, and some of them not in the most legible characters, a circumstance which, it will be appreciated, became an important matter, when considered in connection with the large number of competitors, and the fact that many of their papers were each of several hundred pages in length.

The result of the labors of the committee is, that by unanimous approval the first prize of $500 is awarded to the author of the essay bearing this inscription: "The Five Food Principles, illustrated by Practical Recipes."

Your committee would further report that although there were among the remaining sixty-nine a number of essays of considerable merit, there was no single one so prominently superior to others as to command the approval of the majority of your committee, nor was there any which did not contain some errors of statement which your committee did not feel justified in indorsing with the approval of this association by the bestowal of a prize, or else which did not fail to meet some of the conditions upon which the prize was offered, or which was not otherwise objectionable because of literary defects. Your committee would therefore respectfully report that no essay was found among those submitted to them which they judged deserving of the second prize of $200.

The committee consider it a duty, in awarding the prize, to

emphasize the fact that of all the essays submitted, the one selected is not only pre-eminently the best, but that it is also intrinsically an admirable treatise on the subject. It is simple and lucid in statement, methodical in arrangement, and well adapted to the practical wants of the classes to which it is addressed. Whoever may read it can have confidence in the soundness of its teachings and cannot fail to be instructed in the art of cooking by its plain precepts, founded as they are upon the correct application of the scientific principles of chemistry and physiology to the proper preparation of food for man.

All of which is respectfully submitted.

C. A. LINDSLEY.
GEORGE H. ROHE.
V. C. VAUGHAN.
ELLEN H. RICHARDS.
EMMA C. G. POLSON.

The American public is to be congratulated upon this useful and valuable contribution to the needs of its great army of working people, made possible through the humanitarian benevolence of a private citizen. This was the fifth prize offered by the same citizen, through the same channel, for the noble purpose of ameliorating, in some degree, the hardships which befall mankind in the tireless struggle for existence.

That this essay may be placed in the hands of every family in the country is his earnest desire as well as that of the association; therefore, a price barely covering the cost has been placed upon this volume. It is to be hoped that government departments, state and local boards of health, sanitary and benevolent associations, manufacturers, employers, etc., will purchase editions at cost, or otherwise aid in distributing this work among the people. Although a copyright has been placed upon these essays for legitimate protection, permission to publish under certain conditions can be obtained by addressing the secretary.

We commend this volume to the public, believing it to be an unequaled work upon "Practical Sanitary and Economic Cooking, adapted to persons of moderate and small means."

IRVING A. WATSON,
Secretary American Public Health Association.

INTRODUCTION.

Few things are of more importance than that we should find ourselves physically and mentally equal to our day's work, but not many of us realize how largely this depends upon the food we eat.

Supposing there to be just money enough in a given family to buy the right kind and quantity of food. Now if this money is not wisely expended, or if after the food has been bought it is spoiled in the cooking, the results will be very serious for the members of that family; they will be under-nourished and they will suffer in clear-headedness, bodily strength, and, in the case of children, in bodily development.

Surely the right condition of the body is too important to be left to chance; the best scientific knowledge, the best practical heads should be at its service, and this is the case indeed to a large extent in Europe, where the food of the soldiers and of the inmates of public institutions is furnished more or less according to certain rules that have been deduced partly from observation and partly from scientific experiment.

The application of scientific principles on these lines is not of long standing, for the investigations that have clinched them are all of comparatively recent date. At the end of the last century a beginning was made in France and in Germany in connection with philanthropic efforts to improve the food of the poor, and it was at this time that Count Rumford introduced into the soup kitchens of Munich the soup that has been named after him. From this time on, interest in the subject of foods, both for men and domestic animals, steadily increased, although experimenters were constantly coming to wrong conclusions because the sciences of organic chemistry and physiology, as far as they concerned the subject, were not far enough advanced.

It was only in the early forties that the first experimental agricultural stations were established, but so rapidly have they multiplied that they now number more than a hundred in Europe alone; and in these and in the laboratories of the great

universities, analyses have been made of most of the foods used by men and animals, and also tests of the relative flesh and fat producing power of different foods and combinations of food.

For years the results of these investigations have been applied with profit to the feeding of cattle, but it was a case of threatened wholesale starvation in England that first turned the attention of properly trained persons to a like study of the nourishment of human beings. During our civil war the condition of the cotton spinners in Lancashire and Cheshire, England, became so serious as to make government help necessary to keep them from starving, and in 1862 and 1863 Dr. Edward Smith was commissioned to examine into the dietetic needs of the distressed operatives. In his report for 1863 are found tables of the food consumed per week by 634 families, and in spite of the difficulties standing in the way of such an investigation, the foods consumed were classified into tables showing the amounts of the different food principles taken per week by each family.

One of the great practical results following from this investigation was the determination of the minimum amount of each nutritive principle which men, women, and children need to keep them in fair health. The amount of food with which an unemployed man can fight off starvation and the diseases temporarily incident to it, was found to be represented in thirty-five ounces of good bread per day, and the necessary amount of wholesome water.

Since the publication of Dr. Smith's report, similar inquiries have been instituted by the scientists of other countries, and many analyses have been made of the exact amount and kinds of food eaten by various classes of laborers under the most varied conditions. Professors Voit and Pettenkofer, of Munich, have even accounted for every particle of food that passed through the body of a man, both while he was at work and while he was idle. They have also noted how much of his own body was consumed when he ate nothing. Finally, a great number of averages have been taken and so-called "standard dietaries" constructed, by which is meant the average amount of each of the chief food principles that keeps an average muscle-worker in good condition, when doing average work.

Every one will admit that it is of great importance for the

farmer to know in what proportion he shall lay in hay and other food for the winter feeding of his stock; the animals must thrive, but there must be no waste by furnishing food in the wrong quantities or proportions.

For the housewife, the food question in its relation to her family can be stated in the very same words. It is important that she should economize, but her path will be full of pitfalls if she does not understand in what true economy consists. Most people with a real interest in this subject, have had at some period of their lives certain pet theories as to food. Perhaps they have been at one time convinced that most people ate too much; at another, that meat was the all-strengthener; or they may have been afflicted with the vegetarian fad; and whatever their special views have been they have thought that they rested them upon facts. But surely they would never have pinned their faith to one-sided diets if they had rightly comprehended the main facts of nutrition. We believe that if these facts as at present interpreted, and the world's experience in applying them, can be put at the command of the housewife, she can use them to great profit.

We have employed the term "food principles;" what do we mean by it? Everyone knows what is meant by a food, as meat or bread, and everyone knows that the food offered us by our butchers and grocers comes from the animal and vegetable kingdoms. The oxygen we breathe, and the water we drink, nature furnishes for us directly, so to speak, though unfortunately for many of us, and especially for young children, the former is not thought of as a food. Oxygen aside, it has been found by those who have studied the matter, that all foods contain one or more of five classes of constituents, called "nutritive ingredients" or "food principles." These five principles are: 1. Water. 2. Proteids. 3. Fats. 4. Carbohydrates. 5. Salts, or mineral constituents.

WATER.

It is important to note that our bodies when full-grown are two thirds water, and that our food contains from 1 to 94 per cent of it. Considering the scope of this essay, water must be left to take care of itself as a food.

PROTEIDS.

A class of nearly allied bodies is included under this head. The whole class is sometimes called "albumens." The housewife is familiar with proteids in such foods as the lean of meat, eggs, and cheese. These contain the principle in various proportions; for example:

	Per cent.
Lean of meat has	15–21
Eggs, in both white and yolk	12.5
Fresh cows' milk, on an average	3.4
Cheese	25–30
Dried codfish	30

Vegetables are more deficient in proteids, though the grains and legumes contain much of it.

	Per cent.
Wheat flour has	10–12
Peas, beans, and lentils have	22.85–27.7

In fresh vegetables we find only from ½ to 3 per cent, excepting green peas and beans, in which the proteids reach 5 to 6.5 per cent.

FATS.

Fats are obtained from both the animal and vegetable kingdoms. Those used by us in cookery come mostly from animals, and are known to the housewife as butter, lard, and tallow. Vegetable food, as a rule, is very poor in fats, containing from 0 to 3 per cent only. Some of the cereals, like corn and oats, contain from 4 to 7 per cent of fats.

CARBOHYDRATES.

The bodies classed as "carbohydrates" are found mainly in vegetables. The housekeeper knows them as starches and sugars. Under the starches proper are included such things as the starches of grains and seeds, Iceland moss, gums, and dextrine.

Milk is one of the few animal products that has more than a very small quantity of carbohydrates. It contains on the average about 4.8 per cent of this principle, slightly more than of either proteids or fats.

SALTS.

The things that give hardness to our bones, like calcium phosphate, and the common salt with which we flavor our food, illustrate this class.

FUNCTIONS OF FOOD PRINCIPLES.

To know in what proportion these food principles should be represented in our diet, we must inquire into the part played by each of them in the body. The first and the last principle may be dismissed briefly. The former, water, is the great medium which floats things through the body; the latter, salts, are combined in various ways with the solids and fluids of our foods, and we shall not easily suffer from lack of them.

The three other food principles (let us call them in the following pages the three great food principles), cannot be so summarily dealt with. We might say, briefly and dogmatically, that the proteids are "flesh foods," the fats are "heat foods," the carbohydrates are "work foods." To be sure, experimenters are agreed on the main points, but the different schools are still at war on the final explanations and on many details, and it has become more and more evident that we cannot portion off the work of the body in this simple style. Though each of the three great food principles can be said to have a favorite part which it plays better than any other, yet we find that, like an actor of varied talents, it has more than one rôle in its repertoire.

FUNCTION OF PROTEIDS.

That this class is indispensable, we have the best of proofs. It must be given us in one or another of its forms, for, even if we are not athletes, nearly one half of our body is made up of muscle, which is one fifth proteid, and the nitrogen in this proteid can only be furnished by proteid again, since neither fats nor carbohydrates contain any of it; therefore, in making up bills of fare, let us remember that growing and working proteid, yes, even idle proteid, as Dr. Smith found, needs proteid, and that there is nothing in any of the other food principles that can entirely take its place. Though we think of proteid mostly as a great body builder and restorer, it can also to some extent furnish fat when it stands in a certain relation to the fats and carbohy-

drates of our food, and we are assured by experimenters that it also furnishes heat and muscle energy under certain conditions.

In these last two activities, however, it is far excelled by fats and carbohydrates. We shall, therefore, think of it as the nitrogen-furnisher of our tissues, and also as the grand stimulant among foods, inciting the body, as it does, to burn up more of other kinds.

Scientists at one time held the opinion that our muscle energy comes chiefly from proteids. This view has been abandoned, but many a working man still believes that meat is the only kind of food that is of any account; he thinks of fats and starches as quite unimportant comparatively. Now it has been proved over and over again, that we can combine meat with fats and vegetable food in such a proportion that it shall play only its main rôle, viz.: that of building and restoring, while these latter furnish the heat and muscle energy needed. Proteid food is such a costly article that it will not do to put it at work which cheaper material can do even better.

FUNCTION OF FATS.

The fats also have more than one office in the body. They can be stored as body fat, or they can be burned and give off heat, and they may also serve as a source of muscular energy, in an indirect manner at least.

FUNCTION OF CARBOHYDRATES.

The carbohydrate principle furnishes fat to our tissues, and is a source of heat and muscle energy, indeed the chief source of muscle energy in all ordinary diets.

FLAVORINGS.

So far we have had chiefly in mind the real working constituents of food, if we may so speak. But many things cannot be studied or classified in the above way; they must be looked at from another point of view.

Thus, a pinch of pepper, a cup of coffee, a fine, juicy strawberry, — and what of these? They may contain all five of the food principles, but who cares for the proteid action or carbohydrate effect of his cup of good coffee at breakfast, or what inter-

est for us has the heating effect of the volatile oil to which the strawberry owes a part of its delicious taste?

Surely the economical housekeeper who would throw out of the list of necessaries all the things that tickle the palate, that rouse the sense of smell, that please the eye and stimulate our tired nerves, just because these things contain but little food, would make a grave mistake. She may know just what cuts of meat to buy, what vegetables are most healthful and economical, but if she does not understand how to "make the mouth water," her labor is largely lost. Especially if she has but little money, should she pay great attention to this subject, for it is the only way to induce the body to take up plain food with relish.

The list of these spices, flavors, harmless drinks, and the like, is a long one. Unfortunately, we have no comprehensive word that will include everything of the sort, from a sprig of parsley to a cup of coffee; the German calls them *Genuss-mittel*—"pleasure-giving things."

PROPORTIONS AND AMOUNTS OF FOOD PRINCIPLES.

We have brought our discussion of the three great food principles to the point where we can inquire in what proportions and amounts these should be represented in our diet.

The standard daily dietary that is most frequently cited, and which, perhaps, best represents the food consumption of the average European workman in towns, is that proposed by Professor Voit. This dietary was made upon the basis of a large number of observed cases. It demands for a man of average size, engaged in average manual labor,

Proteids.*	Fats.	Carbohydrates.
118 gms.	56 gms.	500 gms.

*28.34 grams equal 1 oz.

Now it is the opinion of all competent judges, that at least one third of this proteid should come from the animal kingdom and this one third, if given in the form of fresh beef, would be represented by 230 grams of butcher's meat, calculated to consist of

Bone and tendon	18 gms.
Fat	21 "
Lean	191 "

When we take whole populations into account, we find that little if any more meat than this falls to each person per day. Thus the average consumption per day for three great cities is given as follows:

Berlin	135 gms. per cap.
New York	226 " " "
London	274 " " "

Of course these averages include children, but they also include great numbers of the well-to-do, who eat much more meat than their bodies need.

We will add a few more examples of dietaries, some of which are used by the writer in making out the bills of fare given in this essay.

	Proteids. gms.	Fats. gms.	Carbohydrates. gms.
Proposed by Prof. Voit for a man at hard work	145	100	450
Allowed to German soldiers in garrison	120	56	500
Proposed by Prof. Atwater for American at hard work,	150	150	500
By the same for American at moderate work	125	125	450
Proposed by Prof. Voit for a woman	100	60	400
By the same for children from seven to fifteen years,	80	50	320

We will give an instance of how much below these figures the amount consumed sometimes falls.

Professor Boehm found that a poor North German family, consisting of a man, wife, and child five years old, had in one week for their food:

Potatoes	41 lbs.
Rye flour	2½ lbs.
Meat	1¾ lbs.
Rice	½ lb.
Rye bread	12 lbs.

A very little milk.

Calculating the food principles contained in these amounts, we find that the three individuals daily consumed of:

Proteids.	Fats.	Carbohydrates.
175.5 gms.	41 gms.	1,251 gms.

It needs no comment to show how insufficient is this dietary in amount, and how incorrect in proportion.

We have selected Professor Atwater's dietary for a man at moderate manual labor as the basis of our twelve bills of fare and have taken Voit's standard for women and children.

Our climate is more trying and our people work faster, and we shall do well to allow more fat and meat to our workingman than the foreign dietaries provide. If our man is to get daily one third of his proteid in the form of animal food, this would be represented by eight ounces of butcher's meat (without bone), by from five to five and eight tenths ounces cheese, or by eight eggs.

We believe that it is better to go a little high rather than too low with proteid food. As a rule, people who eat enough proteids, and especially enough animal food, are vigorous and have what we call "stamina," and doctors incline to the belief that such people resist disease better because their blood and tissue are less watery than in the case of people who draw their proteids almost entirely from such vegetables as potatoes. But many workingmen in America would be surprised to learn how well health and strength can be maintained on what is, after all, not such a very large amount of meat, provided the rest of the dietary contains enough vegetable proteid and fat.

PRACTICAL APPLICATIONS.

It now remains for us to see whether the economist can get practical help from the foregoing facts about the character of foods and the use that is made of them in the body.

We have seen that we cannot economize in the amount of our food beyond certain limits and yet remain healthy and strong; also that we must not greatly alter the relative proportions in which experience has shown that these foods are best combined. The true field of household economy has, then, certain prescribed limits.

Its scope lies, 1. In furnishing a certain food principle in its cheap rather than its dear form, for example, the proteid of beef instead of that of chicken, fat of meat instead of butter; 2. Having bought foods wisely, in cooking them in such a manner as to bring out their full nutritive value, for instance, making a roast juicy and delicious instead of dry and tasteless;

3. In learning how to use every scrap of food to advantage, as in soup making, and 4, if we add to these the art of so flavoring and varying as to make simple materials relish, we have covered the whole field of the household economist, so far as the food question is concerned.

We hope she will find help in the following pages, for it will be part of our task in this essay to examine different articles of food as to their nutritive value, and to recommend such combinations and such methods of cooking as will make the utmost out of a certain sum of money. As for foods, we have in America a large range of choice; staple raw products cost less generally than they do in Europe, and the laboring man here has somewhat more money to buy with. The anxious provider, who must feed many mouths on what seems an insufficient sum, may feel assured that he can without doubt learn to do better than he now does. In this line we must not disdain to learn lessons wherever we can.

There is an unfortunate prejudice among us against learning of foreign countries. The American workman says indignantly that he does not want to learn how to live on "starvation wages." But the facts, viewed coolly, are just these: the inhabitants of older countries have learned some lessons that we too must soon learn whether we will or no, and to profit by these lessons before we are really obliged to will in no way lower wages, it will simply help us to get more comfort and pleasure out of our money.

Students of economy, political and domestic, find no better school than the experience of older countries, and constantly draw lessons from their greater thrift and economy in living. Mrs. Helen Campbell found, among the poor sewing women of New York, that none were skillful in cooking their scanty food excepting only the German and Swiss women. All observing travelers unanimously give this testimony, "If our American workman knew how to make as much out of his large wage as the foreigner does of his small one, he could live in luxury."

But, you ask, what are the special lessons to be learned of the foreign housewife? We answer, chiefly self-denial and saving. Do not give up in despair because you have a small income and resign yourself to living meanly, in a hand-to-mouth fashion.

Diligent study of the question and resolute abstention from luxuries will solve the problem, if it can be solved.

We indulge ourselves and our children too much in what tastes good, while all the time we know we have not money enough to buy necessaries. For instance, the consumption of sugar in America was, in 1887, fifty-six pounds per head, in Germany hardly more than one third that amount. This means a larger consumption of sweetmeats than we can afford and at the same time be well fed otherwise.

We seem, in general, to spend too much money in our country on food compared with what we use in other directions; one great trouble is that we do not know how to save every scrap of food and use it again in some form. For one thing, we have yet to learn the great art of soup making, — and it seems, also, of soup eating.

The American housekeeper would say to me: "This is nothing new; for years we've been hearing about soups. We don't like soups!" I only ask, "Have you tried them for a considerable length of time, so that you have become skilled in making them, and your family used to their taste?" One fact alone ought to insure for them a good trial; that at least three nations, the French, German, and Italian, make daily use of them and have for generations. To take part of our food in this form is an absolute necessity if we are to do the best possible with a certain amount of money.

PRACTICAL DIFFICULTIES.

The practical difficulties in the way of improvement in household cookery are not small. As cook, we have the wife and mother, who has too little time for this important branch of household work; she has had, perhaps, no good training in the art of cookery (for it is an art), and besides, her kitchen and kitchen utensils are not at all what they should be. Indeed, the qualifications for a given task could not well be further from the ideal.

In Europe families of small means have many helps unknown to us. In the first place, bread is never baked at home, the baker's bread being both excellent and cheap. It would seem that among us bakers' bread must shortly improve in quality and decrease in price; either the profits must be too large or the business

not well managed. For instance, in those parts of Germany where white bread is eaten as a staple, it costs a trifle over three cents a pound, while flour of average quality costs about the same. In contrast with this, compare the prices of bread and flour in our own country where in no large city is bread quoted at less than seven cents, while flour costs three cents. That is, bread costs in Germany about the same as flour and in America more than twice as much; and yet the German baker is notably a prosperous person!

The foreign housekeeper has still further help from the baker. If she makes a cake or pie she sends it out to be baked, and pays from one to two cents (the fuel would have cost more); joints of meat and mixed dishes are also sent to be baked for the same price; and before any bakeshop in a German city, at noon on Sunday, can be seen a line of servant girls each in turn receiving a steaming dish as it is taken from the oven. The soup kitchens (*Volks Küchen*) of various grades are also a great help. The writer has repeatedly had brought from one of them an excellent meat broth (one pint for two cents), and good cooked vegetables are furnished for a price less than they could be cooked for at home, if one took any account of time and fire.

But such helps are not yet to any great extent available to the American woman; she must wrestle with her own problem at home and solve it as best she can.

THE KITCHEN.

The kitchen of a woman of average means is not the ideal kitchen. It is perhaps too small or not light enough, or it may have still more serious defects, as a bad drain. We must take it as it is, however, requiring only that it contain what is necessary to the end we have in view, — plain cooking for a family of six.

Size of kitchen.

In the cheaper city dwellings the kitchen is small, too small for good ventilation and for the heavier kinds of work, as washing; but for cooking, a very small kitchen can be so arranged as to answer every purpose.

Any one who has seen a ship's kitchen can understand this. The cook as he stands before his range is within reach of all his stores, for rows of drawers and shelves literally line the walls from floor to ceiling, little tables for pastry or cake-making are drawn out of the wall and pushed in again when not wanted, and every inch of floor and wall space is used to the best advantage. This cook would tell you that he did not want a larger kitchen ; he would only lose time running about in it.

Arrangement.

Begin to utilize the wall space. If you have not yet as many shelves as the walls will accommodate, put up more, and especially about and above the stove, so that as you stand at your cooking you can reach salt, pepper, and every other flavor that can be used in a soup or stew ; cooking spoons and forks and knives, potlids and holders, — all these should be at your hand. Let a carpenter fasten into the mortared wall strips of wood that will hold nails and a few shelves, and if the stove is in a niche with wall on two or even three sides of it, all the better. On these nails should hang nearly every implement used in cooking, and on the shelves should be found all spices and flavors ; farther back can be placed what is more seldom used. If there are no drawers, never mind, use close tin boxes for as many things as you can ; if no closed cupboard for your dishes, hang a curtain before the open shelves.

The nearer your sink is to the stove the better, that is the path your feet must oftenest travel. There must be a table of some sort very near the stove ; if it is a movable one, all the better, or it may be a broad shelf with a very strong and safe hinged support under it, letting down when not in use.

I take for granted that the main part of your work is to be done on this stove and table, and that a well stocked pantry, fitted out for the making of pastry and cake and elaborate dishes, is not within your reach any more than the time for making such.

Utensils.

The utensils you need are few, but these few you must have. Consider the value of the food materials that you use ; a few burns on an old saucepan will quite buy a new one. We will speak only of the most important and absolutely necessary utensils.

First, do not use tin; it is cheap, but coal is not, and you will waste a great deal of coal in trying to cook in tin. Brass and copper cooking vessels are to be avoided by one who must economize, as they are expensive and require too much care to keep them free from poisonous verdigris.

Of chief importance among your utensils is a flat-bottomed iron pot with close-fitting *iron* lid. Get the smoothest and best, even if it cost double. In this you will roast meat with little fire, cook vegetables, all but peas and beans, cook anything indeed that is not acid. Have two of these, if you can, of different sizes. Next, an iron frying-pan, also of the smoothest wrought iron and light; this, too, should have a close fitting cover. Some people consider iron utensils heavy and old-fashioned, but where economy is an object, no other ware is so good and satisfactory. The blue or gray enameled ware is very nice, but will not stand great heat and easily chips and cracks, but you should have one kettle of this ware, as it is valuable for cooking fruit and anything acid. You must have a wire gridiron for toasting bread and broiling meat; this you should use for many things which you now cook in the frying-pan. The tea-kettle is a matter of course, and the griddle. There is one other utensil not as common, but which deserves to be, viz., a steamer; a simple pot with perforated bottom which will fit tightly into the top of the iron pot, and have a very tightly fitting cover. Its use will be discussed later.

You can hardly do without a number of earthen jugs, glazed with lead-free enamel, especially for cooking and holding milk. Get also a number of wooden spoons; they are cheap and clean, and of convenient shape for stirring. The old-fashioned pudding stick of the Yankee kitchen is the earliest form among us, and many people know no other.

Stoves.

A good stove is of first importance in a kitchen, but fortunately good stoves have become common. A graver question, however, is the cost of fuel to be burned in them. Of course coal must be the stand-by, and when the stove is heated up, as on ironing and baking days, care can be taken to use the fire to its fullest capacity; in winter, dishes can be cooked ahead for several days.

Coal oil.

To cook a single dish or for boiling a tea-kettle a coal oil stove is a saving; it is also invaluable for keeping a pot at a simmering heat, — a thing very difficult to accomplish on a stove.

Charcoal.

For the same purpose and for any steady cooking, and above all for broiling meat, every housekeeper ought to have appliances for burning charcoal; it only needs a grating with a rim two or three inches high, to let down into the stove hole (a sort of deep spider with a grated bottom). For such purposes a bushel of hard wood charcoal costing fifteen or twenty cents would last a long time. Charcoal is almost the only fuel used in Paris for cooking; indeed, throughout France and in Western Germany it is in very common use.

"Cooking safe."

For "cooking safe" as a saver of fuel, see page 226.

PROTEID-CONTAINING FOODS AND THEIR PREPARATION.

We have already in the Introduction called attention to the importance of this food principle. It is well for us to bear in mind that there are three great classes of proteids, albumens proper, caseins, and fibrins, and that in both plants and animals are found representatives of these three classes. Thus, in plant juices and in eggs we have things belonging to the albumen class; in the curd of sour milk and in the legumine of the pod-covered plants we have examples of caseins; and in the gluten of grains and in the clot whipped out of blood we have examples of fibrins.

ANIMAL FOODS.

Our animal food contains some other things that the housewife ranks with proteids and we have a few words to say about one of them, viz., gelatine, that nitrogenous substance boiled out of bones and cartilage.

Gelatine, history of.

In the history of foods this gelatine, like meat extract, has played a great part. Before the real functions of the food principles were understood it was thought that

what could be extracted by water from a piece of meat comprised all in it that was of value to the body; and so it happened that for more than a hundred years after Papin had discovered the method of extracting all the gelatine out of bones (which he did by the aid of that contrivance still known in kitchens as the "Papin Soup Digester") gelatine was considered to be one of the most, if not the most nourishing constituent of meats. In the last decade of the eighteenth century, and in the early part of this, the French made great use of gelatine under the impression that it was a proteid because it yielded nitrogen to the chemist. Improved methods of extracting it were invented, and so general did its use become, especially in the public institutions of Paris, that from 1829 to 1838 two and three quarters million portions of bone-gelatine soup were dealt out to the inmates of a single hospital. But in spite of the opinion of eminent scientists that gelatine soups and gelatine tablets were a perfect substitute for proteids, their consumption decreased; physicians again took hold of the subject, and by the middle of the century opinion had so changed that nearly all, if not all, food value was denied to them. Modern experimentation based on more rational methods has put gelatine in its right place. It is a food, just as much so as is fat; but like fat it cannot play the rôle of proteid, although a certain amount taken with fats and carbohydrates will enable the body to get along with a little less proteid. It is even said by Professor Voit to excel fat in its ability to do half duty for proteid material.

We have thought it well to speak of this because of a sort of superstitious regard in the kitchen for "stock," a survival, one would think, of Papin's time. A good German housewife was wont to discourse to the writer on the economical virtues of a certain "Frau Doctor" who "always boiled her bones three times" and dwellers in many a household have had their nostrils assailed by the smell of glue, during the sixth hour of bone boiling. But if the importance of gelatine was and is still exaggerated, this is still more true of the other parts of meat that can be extracted by water.

Sol. albumen and extractives.

We have seen that hot water coagulates proteid, and once coagulated, it will not dissolve in water, and for this reason the soup generally contains of this valuable

principle only the soluble albumen which rose as scum. If the cook has skimmed this off, the soup which she calls strong is strong with flavors rather than with nutritive principles.

To show how very little real food a good tasting meat soup may contain, we will give an analysis made by Prof. König.

Analysis of soup. He took 1 pound of beef and about 6½ ounces of veal bones, and treated them, he says, as is usually done in the kitchen to get a pint of good strong soup or bouillon. This contained :

	Per cent.
Proteids	1.19
Fat	1.48
Extractives	1.83
Salts	.32

But where are the albumens that were in the meat to begin with? Many of them are still there in that stringy, sodden mass, the "soup meat," which the cook tells us contains no further value. It consists of cooked connective tissue and albumen; now these are foods, and they must be rescued from the garbage barrel, for with the help of the chopping-knife and the herb bag we can make them still do proteid duty in our bodies.

Real importance of soup. If we do not overvalue either the gelatine or the flavoring matters in our meat soups, nor throw away the meat out of which they are made, we shall begin to make soups on the right basis, that is, an understanding of the real value of the materials we are working with, and we shall use meat for our soups less often than we do now perhaps, considering its high price and our greater need of it cooked in other ways. Soups should not be regarded as a luxury, neither as the last resort of poverty, but as a necessary part of a dinner, just as they are now used by all classes in Europe; but they need not be made of good cuts of meat, nor, indeed, of meat at all.

Proteid as we buy it. We will now direct our attention to the proteid as we buy it.

We cannot here take up the chemical composition and exact nutritive value of every kind of meat to be bought at the butcher's stall, the fish market, and the poultry stand; but we must note a few points of importance.

Butchers' meat.

We know that butchers' meat contains from 50 per cent to 78 per cent of water, according to the quality of the piece, and the kind of animal. Most people in buying meat think first of the red part; they may know that it is advantageous to buy meat that is streaked with fat, but they hardly realize how wise it is to do so. As a rule, fat takes the place of water. Let us consult tables of analyses for the amount of water, proteids and nitrogenous extractives, fats, and salts contained in lean pieces and in pieces streaked with fat. In Prof. König's valuable treatise on foods we find such analyses, carefully collected and sifted out of a large amount of material; samples of neck, tenderloin, shoulder, hind quarter, and so on, just as bought at the butchers', were analyzed after being freed from adherent *lump* fat, and the average composition of all the different cuts was as follows:

Prof. König's analyses of meat.

Fat and lean ox compared.	Water. Per cent.	Nitrogenous substances. Per cent.	Fat. Per cent.
From a very fat ox	55.42	17.19	26.38
From a medium fat ox	72.25	20.91	5.19
From a lean ox	76.71	20.78	1.50

These tables illustrate how wise it is to buy meat from a very fat animal. They show that a pound of meat from a fat ox may have more than 20 per cent less water than a corresponding piece from a lean one; of course such a piece may contain from 3 to 4 per cent less proteid, but to compensate for this, it will have 25 per cent more fat.

Let us give another table which illustrates that pieces like tenderloin are not the richest in proteids and fats, though they do have the finest flavor. It may help to console those whose purses do not allow them to buy these expensive cuts:

Dif. parts of ox compared.	Water. Per cent.	Nitrogenous substances. Per cent.	Fat. Per cent.
Neck	73.5	19.5	5.8
Shoulder	50.5	14.5	34.0
Tenderloin	63.4	18.8	16.7
Hind quarter	55.05	20.81	23.32

In this case the difference between shoulder and tenderloin as

to the amount of water contained in each is striking. In the case of *medium* fat and lean animals, poor and good pieces approach each other more nearly in composition.

We regret that the scope of this essay will not allow us to give drawings and full illustrations of the different parts of an animal, with advice in detail as to what to buy. We are glad to mention in this connection a former prize essay — "Healthy Homes and Foods for the Working Classes" — which gives much information needed by the housekeeper as to the qualities and comparative value of the meat from different animals, of milk and milk products.

Some meats compared.

Of butchers' meat beef must always be considered the most economical, its choice being governed by facts just stated. Fat mutton also ranks high.

Pork.

Pork. Say what we may against pork, it is a most valuable kind of meat, especially for the poor man, and the laws governing its slaughter and sale should be so stringent as to protect him. The great importance of salt pork and bacon we have considered under "Fats." It is of little use to give rules about buying this meat; we must generally take what the butcher furnishes, but at least we can cook it well, never eating it raw even when well dried and smoked.

Fish.

Fish. From the standpoint of the economist, fish is worthy of especial mention; nature does the feeding, we have only to pay for the catching. In the season when it is best and cheapest, fresh fish should be used freely. We have only to remind the housewife that she loses one third to one fourth of the weight of a fish in bones and head.

Salted and smoked fish.

Salted and smoked fish is of great importance as food, and not alone for people living on the sea-coast. Salted cod contains, according to König's tables, 30 per cent of proteids, and this fact, together with its low price, fully justifies its popularity with all economical people.

Other salted and preserved fish, as for instance, the herring, give variety in the diet of many a poor family.

LIVER, HEART, ETC.

Internal organs.

Of the internal organs of animals generally considered eatable, we really appreciate only the liver. The lungs, brains, kidneys, heart, and the stomach prepared as tripe, are good food, and they are often sold very cheap in country towns. The head of most animals, as of the calf, is excellent for soups and other dishes, and in the country it is often given away.

EGGS.

Eggs compared with meats as a food.

To get an idea of the comparative value of eggs as a food, let us compare them with medium fat beef.

	Water. Per cent.	Proteids. Per cent.	Fat. Per cent.
Medium fat beef has	72.5	21.	5.5
Eggs have	74.5	12.5	12.

We see that while the water is nearly the same in both, the meat has the advantage in proteids and the eggs the advantage in fat, this fat, moreover, being of very fine quality.

Take eggs at their cheapest, as in April, when they often sell at 15 cents a dozen, that would be 12½ cents a pound, 10 eggs of average size weighing a pound. They could then be considered cheaper than the highest priced cuts of meat, but still much dearer than the cheaper parts, flank, neck, and brisket, at 8 cents. So that even at this low price, they are somewhat of a luxury to the man who must get his proteid and fat in their cheapest form.

And when we consider that only for a short time in the year is the price so low, eggs being on an average quoted at 25 to 30 cents, the showing for them as a proteid rival of meat is poor indeed. Except in the spring the economically inclined must be sparing of their use even in dessert dishes. When housekeepers say, as I have heard them, that eggs at 25 cents a dozen are cheaper than meat, they must be speaking in comparison with very high priced meats.

CHEESE.

Cheese (its food value).

In America, cheese is regarded more as a luxury than as a staple article of food, and yet 1 pound of cheese is equal in food value to more than 2 pounds of meat, it

being very rich in both fats and proteids. Considering this, its price is very low and it ought to be a treasure to the poor man and do good service in replacing sometimes the more expensive meat.

Use of cheese abroad.

Its food value is fully recognized abroad. For the Swiss peasant it is a staple second only to bread, while the use of it in Italy and Germany is extensive. The writer once spent several weeks in the house of a large farmer on the slope of Mt. Pilatus in Switzerland, and observed daily the food given to the harvester; the luncheon sent twice a day to the fields consisted of a quarter section of the grayish skim cheese, accompanied with bread. I was told that the poor people in the region ate scarcely any meat, using cheese in its stead.

The writer has also observed the use of cheese in Germany. Every locality has its special variety of the soft kind made of sour milk, and great amounts of the Swiss, both skim and full milk, cheese are consumed. It is generally eaten uncooked, but also as an addition to cooked food in a great variety of dishes.

Digestibility of cheese.

There is no doubt of the food value of cheese, but there does seem to be some question as to its digestibility. When we come to inquire into this point, we find that thorough experiments have been made by German scientists. Dr. Rübner, a pupil of Voit, gives the result of experiments on himself. He found that he could not consume much of it alone, but that with milk he took easily 200 grams or nearly ½ pound, and only when he took as high as 517 grams, or over a pound daily, was it less completely digested than meat. Professor König says that in the amounts in which it is generally eaten, 125 to 250 grams daily (¼ to ½ pound), it is as well digested as meat or eggs. The extensive use of it abroad would seem to be some guaranty for the digestibility of the foreign varieties at least.

American cheeses have in general a sharper flavor than the foreign, still it is probable that, well mixed with other food, enough could be taken many a time to give a man his needed daily quantity of animal proteid, — between 6 and 7 ounces, — and this is a matter of great importance from an economical point of view.

METHODS OF COOKING MEAT.

Why cook?

And first, why do we cook it at all? In the animal as well as in the vegetable world some foods are all ready for our digestion, as milk. Raw eggs, too, are perfectly digestible and are often given to invalids. We hear of "raw meat cures," and it has been found that tender and juicy raw meat, if chopped fine to break the connective tissue, is well digested.

But raw meat does not taste good to most of us, while the delicious flavor and odor of a broiled steak make it very acceptable to the palate, and we must believe to the stomach also. We "bring out the flavor," as we say, by cooking; what else do we do? Let us examine for a moment a piece of meat with reference to the effect heat has upon it.

Structure of lean meat.

The red part is made up of, first, very tiny sausage-like bags, or muscle fibres as they are called, and in these is contained the precious proteid matter, flavors, and salts all mixed together with water into a sort of jelly; second, these muscle fibres are bound together by strands of connective tissue, as that white stringy mass is called, in which the fat and blood-vessels are lodged; this is also of food value, but inferior to the fibres; third, dissolved in the juices floating between the fibres and strands, there is also a proteid called soluble albumen. The little bags of proteid, when we can get at them, are as digestible in our stomachs as is the white of egg, though, like the egg again, their flavor is improved by slight cooking. But, as we have seen, they are imprisoned in the connective tissue, somewhat, we may say, as are the starch grains of the potato in the cellulose.

Softening connective tissue.

This connective tissue we can soften by heat, thereby turning it into a sort of gelatine, but, unfortunately, unless the meat is very tender, this requires a longer application of heat than is needed to cook the delicate albumen, all full of flavors too easily lost. To soften the connective tissue without overcooking the albumen, is one of the problems of meat cookery.

The next question is, how do our methods of cooking meet these requirements?

COOKING MEAT IN WATER.

1st method. Put a piece of lean meat into cold water, heat it very slowly, and watch the effect. The water becomes slightly red, then cloudy, and as the heat increases, yellowish in color, and finally it clears, sending a scum to the surface. If we examine this scum, we find that the water has soaked out much soluble albumen, and a large proportion of the salts of the meat, as well as other substances called extractives; and now the odor of the boiling meat begins to fill the kitchen. The longer and slower the warming process, the more of all these things we shall extract, and the meat when taken out will be in just that proportion poor.

Soup making. This is the process known as soup making, — very simple, if we care nothing for the piece of meat but to soak out of it all the food and flavors possible. After some hours of cooking we find it shrunken, gray, and tasteless. A dog, if fed on that alone, could not live many days. However, as we have before said, we are not to conclude that it contains no more nutriment, but the stomach rejects it now that it is separated from all the flavoring matters.

2d method. Now put a piece of meat into boiling water, and continue the boiling. The surface of the meat suddenly whitens, and a little scum rises on the water, though very little compared with what we saw in the former method. We have coagulated the albumen contained in all the little cells in the surface of the meat, and the soluble albumen, flavoring matters, and salts cannot get out; the sealing up is not quite perfect, enough escaping into the water to make it a weak soup, but it is a good method of cooking a large piece if properly completed from this point. But if we *go on* boiling our meat, that is, keeping the temperature at 212°, we shall overcook the albumen in the outer layers before that in the center is coagulated. By overcooking, we mean making it horny and flavorless, as we do the white of an egg if we cook it in the old-fashioned way, by dropping into boiling water and keeping it at that heat. Having seared the outside of the meat to keep the juices in, we must lower the temperature. The albumen coagulates at between 160° and 170°, but the water in the kettle may be a little above this,

as it must constantly transfer heat to the interior of the meat. The general rule is that it should "bubble" or "simmer" only, and if the cook can do no better she must follow these indications. That the true temperature for cooking meat is below the boiling point, many an intelligent housekeeper knows; but how is she to know when the water is at 170°? Here we come upon the weakest point in household cookery; various degrees of heat have different effects on the foods we cook, but of only one temperature is the housekeeper certain — that of boiling water.

For the use of the thermometer and the heat saver, see pages 225 and 226.

But to return; is there no way of cooking that will keep in the meat all these flavors and salts and albumens, just as nature mixed them? Yes, there are three ways: frying in fat, baking in an oven, and broiling over coals.

Frying in fat.

We will examine the first. If we plunge a thin piece of meat, as a cutlet coated with egg and bread-crumbs, into boiling fat, the albumen in the surface, or rather, in that of the egg surrounding it, is coagulated as in boiling, but this time the outer rind preserves the juices still better, because the fat will not mix with them as will water. Everyone knows how an oyster cooked in this way retains its juices.

Baking meat.

When we bake a piece of meat in the oven, we start in the same way; we sear the outside in fat, turning the roast about in a small quantity of fat made hot in a kettle; we then transfer it, still in the kettle or pan, to a hot oven, where the process of cooking is completed, but at short intervals we moisten the surface with the fat in the pan. If we did not baste the roast, we would find a thick layer of gray, tasteless meat inside the outer brown crust, and indeed the whole piece would dry long before the center of our roast had reached the coagulating point; we baste, in order to keep in the juices which, as we know, will not mix with the fat, and also that only a mild degree of heat, not exceeding the coagulating point of proteids, may be transmitted to the interior. In the intervals of our basting, some water is driven out of the meat and evaporated into steam, and the high heat of the oven expends itself in evaporating this, in heating the basting fat, and perhaps (if it reach so high a temperature) in decomposing part of it, and in chang-

ing the chemical character of small quantities of extractives, thus making the meat "tasty," and so it happens that only a mild degree of heat is passed into the center of the piece. We would hardly believe that the inside of a roast, with its light pink color, registers only 160° by the thermometer, yet this can be proved by anyone with a long chemist's thermometer. Although some of the water of our meat has evaporated, the extractives and salts are retained to a larger extent than in boiling, as we shall see by the table given later.

Broiling.

In broiling, the principle applied is exactly the same as in baking, the cooking being done by the medium of heated air. The dry heat of the coals affects the outer layer of the meat, as does the hot air of the oven. In both these methods, just as in boiling, we try to hold the temperature of our cooking medium just high enough to keep the heat traveling toward the interior of the meat.

We have now learned to cook the albumen enough and not too much, and to keep the flavors of our meat; what about the connective tissue, and how has that fared with our different modes of cooking?

Tender meat.

If our meat is cut from the tenderer part of an animal of the right age, well fed and fattened, and if it has been kept long enough after killing, the connective tissue will soften into eatable condition in the length of time required to cook the albumen by the methods described. Such meat, so cooked, will always be tender and full of flavor.

Tough meat.

But if the meat is cut from the tougher parts, or from an old or ill-fattened animal, or cooked too soon after killing, the connective tissue will not soften in that time; we must continue the application of heat till this tissue softens.

Methods compared: 1st, as to quality of meat.

Therefore, what method of cooking we shall use, depends on the quality of the meat we have. Trimmings and tough portions we will make into soup, expecting to chop the tasteless meat next day, and add other flavors to make it palatable. Somewhat better pieces, but still requiring long cooking to soften the connective tissue, may be made into a stew or ragout; or, if the piece is large and compact, boiled in water; but meat that is tender and juicy (and for improving

tough meat see page 226) should be boiled, baked, or broiled, choosing oftenest the last two methods, because of the more perfect retention of the juices and the fine flavor given to the outer layer.

2d, as to economy.

We are told that baking or broiling is a very wasteful way of cooking meat; that if we would be truly economical we would always boil or stew, using our meat or its juices to flavor vegetables. From this we must dissent, for it would condemn us to such a monotony as would be unendurable even to the poor. Better sometimes a smaller piece of broiled or baked meat with its delicious and stimulating flavor, and make our soup with vegetables and season it with herbs. Besides, according to the scientists, baking and broiling are *not* wasteful methods. I quote from a table of Professor König's, wherein are given the results of analysis of beef raw, after boiling, and after *braten*. Raw, it contained .86 per cent extractives (nitrogenous bodies mostly; very important as giving the stimulating smell and taste) and 1.23 per cent salts.

	Extractives.	Salts.
Raw	.86 per cent.	1.23 per cent
After boiling	.40 per cent.	1.15 per cent
After *braten*	.72 per cent.	1.45 per cent

The advantage is seen to be in favor of *braten*, both in regard to extractives and salts. The loss of water was nearly the same in both cases. As for the fat lost in broiling a beefsteak, that is indeed a loss, but one to be made up in some measure by the smaller quantity of fuel necessary to cook the meat. The loss of this fat need not be made so much of, until we have learned to do better in many other still more important directions.

The philosophy of cooking meat according to the different methods has been treated, and we will now give a few additional directions as to carrying out these methods.

SOUP MAKING.

Materials for soup making.

Lean meat of any sort, beef best; fresh, better than that long kept; bones of next value, especially the spongy rib bones and vertebræ. Saw and chop the bones into little pieces, — cut the meat small. Soft water is better than hard.

Method of making. Keep a kettle, if possible, for this purpose alone, and add to it all bits of meat and bones as they accumulate. Put the meat into cold water, let it stand some hours if possible, heat very gradually, and keep *simmering*. Two hours or less brings out all the flavors of the meat, but a much longer time is necessary to get all the nutriment from the bones.

Skimming. Do not remove the scum; it contains the albumen of the soup, and nothing objectionable if the meat was well cleaned.

An hour before the soup is served, add flavors; onions and carrots are the best, celery, summer savory, and parsley next. Use others, as cloves, nutmeg, bay leaf, etc., only occasionally. Add salt and pepper just before serving.

When done, strain and skim off all fat (better if left to stand till next day, the fat removed, and the soup simply rewarmed), and make such additions as you wish.

[We prefer our soups with the fat removed, but the laboring people of Europe with their hardy stomachs find a soup much better if covered with "eyes."]

These rules apply to all meat soups. Mutton makes a strong and nutritious soup, veal a delicate soup. An excellent soup is made from a calf's head.

BOILING.

To boil meat. Put the meat into boiling water, bring quickly again to a boil and keep so for ten minutes, then lower the temperature (as see page 219), and so keep it till the meat in the center has reached 160°–170°, or has changed in color from bluish to red, our usual test. For use of the "cooking safe" for this purpose, see page 226. Braising, "a la mode," kettle roasts, etc., are but modifications of this method.

To make meat stews. This is a combination of soup making and boiling. Use inferior parts, cut in pieces and cook, at 170° if possible, till tender. Half an hour before serving, season in any way you wish. See page 228.

FRYING IN FAT.

How to prepare suet in which to fry meat. Lard, if used for this purpose, should be tried out at home, but beef fat is cheaper and if nicely prepared no one can object to the taste.

Cut the fresh suet in pieces, and cover with cold water. Let it stand a day, changing the water once in the time. This takes out the peculiar tallowy taste. Now put it in an iron kettle with a half teacup of milk to each pound of suet, and let it cook very slowly till the fat is clear and light brown in color, and till the sound of the cooking has ceased. The pieces may be loosened from the bottom with a spoon, but it is not to be stirred; if it burns the taste is ruined. Now let it stand and partly cool, then pour off into cups to become cold; it smells as sweet as butter and can in many cases be used instead of it. The fat still left in the pieces may be pressed out for less particular uses. Any clean fat, even mutton, has its uses in cookery and should be tried out and kept nicely.

Oils for use in frying.

There are oils now sold which but for prejudice we would always use. *Pure* cotton-seed oil is a fine oil with a delicate flavor; rape seed oil, which is used extensively abroad for this purpose, is also a pure vegetable oil, but somewhat rank in flavor. It is treated thus: a raw potato is cut up and put into the kettle, heating with the oil and cooking till it is brown, it is then taken out and the oil used like lard. The potato has absorbed the rank flavor.

Thin pieces of meat, like cutlets and chops, are coated with beaten egg and bread crumbs and cooked in boiling fat for five to ten minutes, according to the kind of meat.

To bake meat.

Make some beef fat hot in an iron pan or broad kettle. Put the meat into it, and with a fork stuck into the fat part, turn it rapidly till it is on all sides a fine brown, then put it into a hot oven (about 340° F.), elevating it above the pan on a meat rack, or a few iron rods. Now comes the process called basting; in five minutes or less you will find that the top of the meat has dried, and you must now dip, with a spoon, the hot fat from the pan over the top. Do this every few minutes, adding no water to the pan; you will find your meat well cooked in from twelve to fifteen minutes to the pound. It is done when it has lost, in the middle, the blue color, and become a fine red. Only salt and pepper should be used to season such a roast, and must be added when the meat is half done; if earlier, it toughens the fibres.

Basting.

To broil meat.

But when fuel is expensive, or in summer when a hot fire is a nuisance, the perfectly cooked meat can also be obtained by broiling; the management of the fire is the only trouble. We are told that a beefsteak for broiling should be cut three fourths of an inch thick, and put over a hot fire of coal or charcoal; quite right, but when it has browned quickly, as it should, and been turned and browned on the other side, it yet remains raw in the middle, and if left longer the surface burns. This is the experience of the novice, who has yet to learn two things; first, that immediately after the first browning, the fire must decrease in heat, or the meat be brought further away, so that the steak may cook ten to twelve minutes without burning — less time will not cook it nicely in the middle; and second, that like baked meat, the surface must be kept moist with hot fat. Before your steak is put over (unless it be very well streaked with fat), cover both sides with melted suet, and afterwards, as it dries, spread on a little butter or beef fat. Have ready in a hot platter a few spoonfuls of water in which the bones cut from the steak have been boiling, also salt and pepper. When the steak is done, lay it in a platter and keep it hot for five minutes, turning it once in the time; thus you will have both good steak and good gravy.

Use of charcoal.

Professional cooks always use charcoal for broiling, and its advantages are great. As described on page 211 it needs only a simple contrivance, easily adjusted to any stove; a handful will broil a pound of steak, and the cooking of the rest of the dinner can go on without interference.

USE OF THE THERMOMETER IN COOKING MEAT.

To cook meat at a temperature of between 150° and 160° F., is no easy matter with the usual kitchen appliances. Even over an easily regulated heater, as a gas or coal oil flame, how are we to know that temperature when it is reached? The writer, knowing of no thermometer arranged for use in a kitchen, constructed a simple one after the model of those used in laboratories. A thermometer tube registering 300° Celsius was simply fastened into a cork, the bulb projecting below and protected by a short cylinder of wood. This floated on the water and made

it easy to cook at any given temperature. This thermometer was also hung in a light wire frame and used for testing the heat of an oven.

THE HEAT SAVER.

It is a part of common information that the inhabitants of northern countries make extensive use of non-conducting substances, like wool, for preventing the escape of heat from a vessel in which cooking is going on. It is strange that we do not make more use of such appliances, for they have often been described and illustrated; it is probably because they are not found ready-made, and with a complete list of directions for use. The writer made and used a cooker of this sort, and after considerable modification and experiment it became a useful thing in the kitchen. If you wish to cook meat at the proper temperature, this contrivance makes it possible to do so, and is also very saving of fuel.

Directions for making heat saver.

Take a packing box, measuring say two feet each way, and cover the bottom with a layer of packed wool four to six inches thick; set into the middle of this another box or a cylinder of sheet iron and fill the space between the two with a layer of wool four to six inches thick and closely packed. Into the inner compartment put your kettle of meat or vegetables already brought to the boiling point and having a tightly fitting cover, and over this press a thick pillow or woolen blanket. Then fasten down tight over all the lid of your box. As the heat in the water must finish the cooking already begun, its amount must be rightly proportioned to the amount of food to be cooked, e. g., two quarts of water to one and one half pounds beef rib were used. The water was brought to the boiling point, the meat placed in it and allowed to boil for five minutes, the pot was then tightly covered, placed in the box and allowed to remain three hours. At the end of that time the meat was tender.

TO MAKE MEAT TENDER.

To make meat tender.

It is well known that meat must be kept some time after killing to make it tender. In winter a large piece of beef or mutton will keep for six weeks if hung in a dry,

cool place. Indeed, this is the time allowed in England for the Christmas "shoulder of mutton," and every few days it is rubbed over with salt and vinegar. In summer, unless the butcher will keep the meat for you, you must resort to other means.

A tough piece of meat may be laid in not too strong vinegar for three or four days in summer and twice as long in the winter, adding to the vinegar such spices as you may like. To soften a tough steak pour a few spoonfuls of vinegar on and let stand for twelve or twenty-four hours. This method has been long recommended and is to some extent used among us; the foreign cook employs sour milk for the same purpose and with even greater success, but this must be changed every day and at the end of the time well washed from the meat.

We cannot too strongly urge that the housekeeper, especially if she be straitened in means, should become used to these methods and practice them occasionally. She does not want to confine herself to soups and stews and she cannot buy "porterhouse" steak at twenty or twenty-five cents a pound, but she can buy "round" at half that price, and after a little experiment can make it tender for boiling, roasting, or broiling by one of these methods. In winter, she should buy a supply of meat ahead and keep it until it grows tender.

RECIPES FOR COOKING MEAT.

The methods of cooking meat having been treated, and mention made of the parts adapted to each, it remains only to give practical hints as to making and varying dishes.

BEEF.

Boiled, roast, and broiled beef have been sufficiently dwelt upon. See pages 219-226.

Stews and ragouts.

No mode of cooking meat has so many variations; the flavor of the meat being used to season vegetables of every sort, also doughs, as in dumplings, or in the crust of meat pie. For making meat stews see page 223.

With potatoes. One half hour before the meat is done lay on top of it peeled potatoes, all of the same size, and serve when done with the meat and gravy.

Meat pie. When the meat is cooked tender, thicken the gravy and pour all into a pie or pudding dish. Cover with a common pie crust or one of mashed potatoes, and bake one half-hour. You may also mix sliced raw potatoes with the stew, in layers.

Potato crust: One cup mashed potatoes, one egg, two tablespoonfuls butter, one cup of milk, salt. Beat together till smooth, and then work in enough flour so that you can roll it out. It should be half an inch thick, and as soft as you can handle.

With tomatoes. Add to meat when tender, one quart tomatoes to two pounds meat. Thicken with flour and stew five minutes.

Flavors for stews. Stews are variously flavored; onion, salt, and pepper are always in place. A little lemon juice added as it is served gives a delicious flavor, or even a tablespoonful of vinegar may be used. Any herbs, a piece of carrot, a clove or bit of garlic may be used for variety. Catchup is also good as a flavor.

Corned beef. Wash it well, put into plenty of cold water and bring slowly to the simmering point. Cook three to four hours.

Turnips or cabbage are often eaten with corned beef. They should not be boiled with the meat, but in a separate pot.

Beef liver. If from a good animal, beef liver is often as tender as calf's liver.

Broiled. This is the best method. Soak an hour in cold water, wipe dry, slice, and dip in melted beef fat. Broil slowly (see page 225) till thoroughly done, then salt and butter.

Fried. When prepared as above, the slices of liver may be fried in a pan with a little beef fat. This gives an opportunity for more flavors, as onion may be fried with it, a little vinegar added to the juices that fry out, then thickened and used as gravy.

Baked. If liver is not quite tender it can be made into a stew, or it may be chopped fine, mixed with bread crumbs and egg, and baked half an hour.

Beef's heart. If fire is no object, you may boil a beef's heart; it will take all day. Put into cold water and bring slowly to the simmering point and keep it there. Next day it may be stuffed with well seasoned bread crumbs and baked three fourths of an hour.

Tripe. Cut in strips, soak in salt and vinegar one half-day, wipe dry and fry in hot lard. It may also be stewed.

RE-COOKING BEEF.

(A.) Boiled, baked, or broiled beef which is tender and full of flavor.

To serve roast beef a second time:

Roast beef reserved. Heat the gravy, put the roast in it. After trimming it into shape again, cover closely and put into a hot oven for ten minutes or less, according to size of piece. *Or*, cut in slices and lay in hot gravy only long enough to heat them through.

Hash. Being full of flavor, such meat may be chopped and mixed with from one third to one half as much chopped or mashed potatoes, bread crumbs or boiled rice. These mixtures may be warmed as hash, or made into cakes or balls to be fried on a griddle or in boiling fat.

Mix the chopped meat with the potatoes, bread crumbs, or rice, as above, add salt and pepper, and make quite moist with water or soup. Put a good piece of butter or of beef fat into a spider, and when it is hot put in the hash. Cover and let it steam, then remove cover, and let it dry out while a brown crust forms on the bottom. *Or*, stir till hot, and dish immediately.

Hash balls. Make not quite as moist as for hash, form into little cakes, dust with flour, and fry to a nice brown in a little beef dripping on a griddle. *Or*, egg and bread crumb the balls, and fry in boiling fat.

RE-COOKING SOUP MEAT.

(B.) This meat, though made tender by long cooking, has given much of its flavor to the soup. It has not, to the same degree, however, lost its nutritive value; if we can make it *taste* good again, both palate and stomach will approve it. It will not do to mix this meat with neutral substances like potatoes and bread; it needs addition rather than subtraction. In any case, first chop the meat very fine.

Pressed soup meat. Season the chopped beef well with salt and pepper, and some other addition, as celery salt or nutmeg, or some of the sweet herbs. Moisten with soup or stock, pack in a square, deep tin, and place in the oven for a short time. To be sliced cold, or warmed as a meat hash to be served on toast.

Meat croquettes. When so good a dish as this can be made out of soup meat, it is worth a little trouble. *Ingredients.* Two cups of the chopped beef, one tablespoonful butter, one tablespoonful flour, one egg, one half a lemon or one tablespoonful vinegar, a few gratings of nutmeg, and one half cup of stock or milk. Cook the flour in the butter, and add the stock or milk and seasoning, then the beef, and cook, stirring all the time till the mass cleaves from the side of the kettle. Let it get cold, then make into little egg-shaped balls, let them dry a little, roll in beaten egg and bread crumbs, and fry in boiling fat. To vary, add one third as much chopped salt or fresh pork as you have meat.

VEAL.

This meat takes other flavors well, and is used by cooks for all manner of fancy dishes. It is lacking in fat, and for that reason easily dries in cooking; an addition of pork is always an advantage to the taste. It must be always well cooked, never rare.

Roast veal. This may be a piece cut from loin, breast, or shoulder, or a rib piece. Roast like beef (see page 224), allowing twice as long, or one and one half to two hours for any piece under four pounds.

Broiled veal chops. Cutlets, chops, and steaks are broiled like beef, but slower and twice as long, and must be buttered and floured to prevent drying. Should be served with a tomato or onion sauce.

Veal stew.

Cook like beef stew (see page 223). It may be varied in the same way, and is generally more highly seasoned. Especially good as pot-pie. Salt pork should be added to it.

Liver, sweetbreads, and heart.

Veal liver, sweetbreads, and heart are all tender and excellent, but high priced, especially the sweetbreads. Liver and heart are prepared like the same parts in beef (see pages 228-229), but the heart cooks tender in two hours. This latter is an excellent dish; do not soak it; stuff with well seasoned bread crumbs and bake, basting well.

MUTTON AND LAMB.

Mutton and lamb.

The quality of mutton is so varying that when cooked the dish is often a disappointment. The influence of long keeping or "hanging" upon it is even more beneficial than upon beef.

Mutton fat.

Fat of mutton. Some cooks trim away every bit of fat from mutton. It is perfectly wholesome, but sometimes gets a taste from coming in contact with the hide or hair of the animal; hence the prejudice. Scrape the outside of the meat well, pulling off the dried skin and cutting away the dark ends.

Pieces to roast.

Unlike beef, other pieces besides the rib are good for roasting; the loin and haunch are most economical, the shoulder next, the leg next. Roast like beef (see page 224). Unless the meat is first-class, do not roast but boil it. The leg is oftenest used for this purpose.

To boil mutton.

Simmer about twelve minutes to the pound; that is the rule, but very frequently the meat when it comes on the table will be tough, owing entirely to the difference in the quality of the meat. Such meat must be boiled twice as long, or is better cooked in a stew.

Mutton chops.

The chop is oftenest broiled, and is a famous dish. Cut three fourths of an inch thick, and broil rare like beef. Chops and cutlets are excellent fried in fat (see page 228).

Mutton stew.

This is the most economical and perhaps the most satisfactory of all mutton dishes. The inferior parts, as the neck, are as good as any for this purpose. Proceed

exactly as with beef stew. A good stew is made from sheep's kidneys.

Sheep tongues.

These may be mentioned because sometimes thrown away or sold very cheap. Clean well, and simmer one and one half hours with a little pork and onion. Add to the gravy one tablespoonful of vinegar.

All these recipes for mutton apply to the cooking of lamb; remembering, however, that lamb, like veal, must be thoroughly cooked.

PORK.

Pork does not need to be kept in order to be tender; that is one of its great recommendations to the housekeeper. It is also easily cooked, and we may lay aside some of the precautions we use regarding beef; the lean of fresh pork, however, is apt to dry in cooking.

Roasting pieces.

The leg, the loin, and the chine are good roasting pieces, as well as the rib. Pork is so rich in flavor that it seasons finely a bread crumb dressing, to which add a little sage and vinegar or chopped pickles. Bake separately, and lay around it when served. Or, better, though more trouble, make holes in the roast and force the stuffing in. Put directly into a hot oven in a pan containing some hot fat, and baste very frequently till done. Allow at least twenty minutes to the pound.

Steaks and chops.

Steaks and chops are broiled, but the surface must be kept well moistened with butter or beef fat, or they will be dry and tasteless.

Stew of pork.

Fresh pork is seldom boiled and it is too fat for a stew, though the lean may be selected and cooked like beef stew. It makes also an excellent pot pie or meat pie. See page 228.

Pig's liver.

Pig's liver is good cooked like beef's liver, and is cheaper. See page 228.

Pork sausage.

The cooking of this is very simple. Fry brown in a frying-pan on the stove, or better, set the pan in a hot oven; you will then avoid the sputtering of the fat.

HAM, SALT PORK, AND BACON.

Ham may be cooked in any way in which fresh pork is cooked. It may be cut in one half inch slices, or thinner, and broiled or fried lightly in a pan. If long cooked it becomes tough and dry. If too salt for this, it may be soaked a half-hour in warm water. A large piece of ham is best boiled. If very salt, soak it in cold water for twenty-four hours, then put into cold water, bring slowly to a boil, and simmer half a day if the ham is of good size. A ham may also be baked.

Dishes from cold ham. So highly flavored a meat can be used in numberless ways, especially combined with vegetables and bread.

Sandwiches. Chop one half pound fine, season with mustard, pepper, and one tablespoonful vinegar. Spread between slices of buttered bread.

Ham cakes. Take one cup finely chopped boiled ham, two cups of bread crumbs, two eggs, pepper and salt, and enough milk to make quite moist.

To use. First, fry on a griddle in small spoonfuls, and turn as pancakes. Second, use mashed potatoes instead of bread crumbs, and fry as above.

Croquettes. Third, take either of the above mixtures, using, however, little or no milk, make into little balls, and after rolling in egg and bread crumbs, fry in boiling fat.

With eggs. Fourth, with eggs. Put either of these mixtures into a baking dish ; smooth the surface and make little hollows in it with the bowl of a spoon. Put in the oven till hot, then break an egg into each depression, and return to the oven till the eggs are set.

Broiled salt pork and bacon. After slicing thin, freshen salt pork by laying in cold water over night or one half-hour in warm water. Broil till transparent and a delicate brown in color. Broil bacon without freshening.

Fried. Less delicate than broiled, but much more economical, because saving the fat. Fry only till transparent. Salt pork must be first freshened. To make milk gravy of the fat, see "meat and vegetable sauces," page 247.

Both salt pork and bacon are boiled with vegetables.

Bacon or pork and Cabbage: This is a favorite mixture, and if the cabbage is only boiled half an hour and not in the same pot with the pork, it is not an indigestible dish. Put the pork into cold water, bring slowly to a boil, and simmer from one half to two hours, according to size of piece.

Pork and peas. Cook one quart of dried peas according to directions for pea soup. Boil pork with the peas during the last hour, or after parboiling bake like pork and beans.

Pork and beans. Cook one quart beans according to soup recipe. Parboil one pound salt side pork, score the skin in squares, half bury in the beans, and bake two hours or till a nice brown.

Pork and potatoes. Slice a dozen potatoes thin, also one fourth pound fat salt pork, put into a pudding dish in alternate layers, seasoning with salt and pepper (only a little of the former). Bake, covered, one half-hour, uncover and brown.

Pork and apples. Fruits seasoned with meat juices and fats, instead of with sugar, are not enough known among us. Slice sour apples round in slices one third of an inch thick without peeling, and fry with strips of pork or bacon. Serve together.

FRESH FISH.

The varieties of fresh fish are numberless, and to cook and serve them in perfection requires careful study from the cook. The subject must here be treated very briefly.

Fresh fish may be cooked in any of the ways applicable to meat, the length of time being much shorter and care being required on account of the delicacy of the fiber. This makes broiling somewhat difficult. Small fish are perhaps best egged and bread-crumbed and fried in hot fat.

Fish chowder. This dish deserves especial mention because of its cheapness and good flavor. It may be made of any fresh fish. Fill a pudding dish with the fish cut in pieces, seasoning each layer with salt and pepper and bits of suet or fat pork. Put over it a potato crust as for meat pie (see page 228), or a soda biscuit crust, and bake. Bread crumbs or sliced potatoes may be mixed with the fish and more seasoning used.

Fish soups.

Fresh fish can also be made into soup, and the cheaper kinds should be more used for this purpose.

Codfish soup.

Cook one tablespoonful of flour in one tablespoonful of butter. Add one and one half quarts of milk, or milk and water, and when it boils stir in one teacupful of cold boiled codfish that has been freed from skin and bones and then chopped fine or rubbed through a sieve. Add salt and pepper to taste.

Bullhead or catfish soup.

An excellent soup can be made of this cheap fish. Clean and cut up two or three pounds and boil an hour in two quarts of water with an onion and a piece of celery or any herbs (it must be well seasoned). Then add one cupful of milk and a piece of butter or beef fat, or a piece of salt pork cut in bits may be boiled with the fish.

SALT FISH.

Salt cod.

This is one of the cheap foods that seems to be thoroughly appreciated among us, and good ways of cooking it are generally understood. It must be freshened by laying it in water over night; put into cold water and bring gradually to a boil, set the kettle back where it will keep hot for half an hour, separate the flakes, and serve with a milk sauce.

Fish balls.

This favorite dish is prepared by adding to codfish, boiled as above and finely shredded, a like quantity of mashed potato. Make into balls and fry on a griddle or in boiling fat. Any other fish can be used in the same way.

FOWLS.

The flesh of fowls cannot rank among cheap foods, but in any economical family the Sunday dinner may often be a fricassee made of a fowl no longer young. Unless very ancient, the flavor of such a fowl will be richer than that of a chicken; we have but to cook it till it is tender.

Old fowl fricasseed.

Cut into joints, put into cold water, and bring slowly to a simmering heat; on no account let it boil, — keep it as nearly as possible at 170° for three or four hours, or till it is very tender. At the end of two hours add a sliced onion and salt and thicken the gravy.

Chicken soup. None but the wealthy should use chickens for soup, but from the bones left of baked or fricasseed chicken a good and economical soup can be made. Boil an hour or two, take out the bones, thicken a little, and serve with bread dice fried in butter.

Giblet soup. An excellent soup can be made of the giblets, that is, heart, liver, and neck of chicken and other fowls which in city markets are sold separately and very cheap. Cut in small pieces and boil two hours with onion and herbs, then add a little butter and thickening, salt and pepper.

EGGS.

The importance of eggs is to be estimated from various points of view; their food value is great, their digestibility when fresh is almost perfect, and they can be cooked in so many ways and are a necessary ingredient of so many dishes that the cook could ill spare them. Indeed, in all countries their consumption seems to be limited only by their price.

Freshness. After the first twenty-four hours an egg steadily deteriorates. Physicians say, "never give to an invalid an egg that is more than two or three days old."

There are methods in use for preserving eggs fresh, on the principle of excluding air by sealing up the pores of the shell, but none of them are without risk and they cannot be recommended to one who must economize closely. It is better to go without eggs as nearly as possible in winter.

Raw eggs. Eggs are as digestible raw as cooked, and one easily comes to like the taste of a fresh raw egg beaten to a foam and mixed with a little milk or water and sugar, flavored with a little nutmeg or jelly.

Soft boiled eggs. To soft-boil an egg its temperature should not be raised above 170°. The white will then be a jelly-like digestible substance, but if exposed to a higher temperature the white becomes horny while the yolk remains uncooked or becomes pasty. There are two methods of boiling an egg properly which may be adopted according to convenience.

1. Allow one quart of boiling water to four eggs. Use a pail or jar (heated before the water is put in) and wrap around with a

flannel cloth. The eggs will be done in six minutes, but are not harmed by ten.

2. Put the eggs into cold water and bring slowly to a boil. They are done when the water begins to boil.

Hard boiled eggs. To boil an egg hard it is no more necessary to expose it to a high degree of heat than in the case of the soft boiled; the heat must simply be much longer continued, twenty minutes to a half-hour. The egg will then be solid, but not horny as when cooked in boiling water. A great many attractive dishes can be made of cold boiled eggs.

Scrambled, poached, omelet, and baked eggs. These are but different modes of cooking eggs soft or solid. The taste will be more delicate, and they will be more digestible if in these cases also only the low degree of heat above mentioned be applied, more time being given them than is usually allowed.

EGG DISHES.

These dishes, under many names and in many forms, are of next importance after meats, composed, as they generally are, of eggs and vegetables or some preparation of the grains, while numberless additions and flavors are used to give variety and make the dish tempting to the eye and palate. Eggs so prepared have their full nutritive value; not so in rich puddings and cakes, where they are mixed with more sugar and fat than the system can take up in any quantity.

The following are a few recipes that have not been included under other heads. Many others will be found under the Cooking of the Grains:

Bread omelet. One cup of hard bread partly softened in hot water and milk, or in cold water (in which case press in a cloth and crumble), add one half of a chopped onion, one tablespoonful chopped parsley, one egg, salt and pepper. Heat in the frying pan, or square baking pan, some bits of suet or beef fat, and pour in the omelet. Cover and bake five minutes, then uncover and brown. Or, it may be cooked slowly on top of the stove. Cut in pieces, and serve around the meat or with a gravy.

Egged bread. Bread, fresh or stale, is cut in long strips, or in squares or rounds with a cake cutter. Let them soak

till soft but not broken, in one pint of salted milk into which two eggs have been beaten. Bake a nice brown or fry on a griddle in half suet and half butter. (May be made with one egg.)

Potato omelet. Fry a small onion, sliced, in a teaspoonful of butter or fat; fill the pan with two cups of cold sliced potatoes, salt and pepper them, and pour over them two beaten eggs. Bake slowly till it is just solid, and turn out carefully on a platter. *Or*, one cup potatoes and one cup bread crumbs may be used.

Rice omelet. One cup cold boiled rice, two teaspoonfuls milk, one egg, one half teaspoonful salt. Mix and pour into a pan in which a tablespoonful of butter has been heated. Fry and double over when done. *Or*, it may be baked like potato omelet.

Flour omelet. One egg, one cup milk, two tablespoonfuls flour, pinch of salt, add the beaten white of the egg last. This is the "Yorkshire Pudding" which is cooked in the pan over which beef is roasting; it is cut in squares, and served around the meat. It may also be baked in a buttered pan without meat.

Tomato omelet. Three eggs, one cup flour (scant), a tablespoonful fine herbs, salt and cayenne pepper, one tablespoonful sugar, juice of two large tomatoes, and one cup warm milk. Bake under roasting meat, or alone in a buttered pan.

CHEESE DISHES.

Almost any cheese will give a good result in these dishes. Crumbly cream cheese is richer in taste, and has also been shown to be more quickly digested. Skim cheeses are as nutritious except in fat, and in some dishes, as in "fondamin," give a better result. Grate old cheeses, chop new and soft ones.

Grated cheese. Grate old cheese, and serve with bread and butter. It is also a good addition to mashed potato, to flour porridges, to oatmeal and wheat flour porridges, to rice, sago, tapioca, and indeed to any starchy foods; it should be stirred in while these are quite hot. Its use with macaroni is given elsewhere.

Cooked cheese with bread.

The basis of these dishes is toasted bread (white or graham) arranged on a platter, and enough salted water poured on to soften it.

1. Grate enough old cheese to cover the toast prepared as above. Set in the oven to melt, and put the slices together as sandwiches. This is the simplest form of "Welsh Rarebit."

2. One half pound cheese, one tablespoonful butter, and one cup milk. Stir till smooth over a gentle fire or in a water bath, and spread over the toast.

3. One fourth pound cheese, one tablespoonful butter, two egg yolks, one half teaspoonful mustard, a pinch of cayenne pepper. Stir to smooth paste, spread on the toast, and set in a hot oven for four minutes.

4. To each person allow one egg, one tablespoonful grated cheese, one half teaspoonful butter or one tablespoonful milk, a little salt and pepper (cayenne best). Cook like custard in a pail set in a kettle of hot water, stirring till smooth; it may then be used on toast or poured out on a platter. It may also be steamed five minutes in little cups, or baked very slowly for ten minutes.

5. Slices of bread lightly buttered, 3 eggs, one and one half cups milk, one teaspoonful salt, one cupful grated cheese. Soak the bread in the milk and egg till soft but not broken. Lay the pieces in a pan, cover with the cheese, and bake or steam.

Fondamin or fondue.

This is a famous foreign dish, and although it may seem to have a good many ingredients, it is really not much trouble to make. One fourth pound grated cheese (skim better than cream), add to one gill of milk, in which is as much bicarbonate of potash as will lie on a three cent piece, one fourth teaspoonful mustard, one half saltspoonful white pepper, a few grains of cayenne, one ounce butter, a grating of nutmeg, and two tablespoonfuls baked flour. Heat carefully till the cheese is dissolved. Add three beaten eggs, and stir till smooth. This mixture should be baked separately for each person in patty pans or paper cases, and eaten immediately. All cheese dishes should be served very hot.

MILK.

Milk is sometimes called the one perfect food, containing all the constituents in their right proportions. This is true only for the requirements of a baby, but it remains for any age a valuable food when rightly supplemented. Milk contains on the average 3.31 per cent proteids, 3.66 per cent fat, 4.9 per cent carbohydrates, 87.41 per cent water, and .70 per cent salts. The housewife, if she wishes to use milk with economy, will not in cooking use it *as such*, but with due regard to the different values of the cream and the skimmed parts. In cities skimmed milk is sold for about one half the price of full milk, and is well worth it if pure, but it is too often mixed with water.

Boiling milk. As soon as milk comes into the house it should be boiled, as it is a notorious carrier of disease germs which only in this way can be killed. Use an earthenware pitcher, and let the milk remain standing in the same after cooking. The next day remove the cream for the morning's coffee, and use the skimmed part during the day for cooking, with or without the addition of a little butter.

Keeping milk. To keep milk sweet in warm weather is a serious question to the housekeeper who has no cellar or refrigerator. It is of first importance that the vessels used to contain it should be scrupulously clean. Boiling, as above mentioned, and cooling it rapidly afterwards, will keep it sweet for twenty-four hours, unless the weather is very warm, and the time may be further extended by keeping the milk pitcher set in a dish of cold water. A quarter of a teaspoonful of baking soda to a quart of milk, added while it is still sweet, may be used in case of necessity, but this is not to be commended for common use.

Canning milk. A method that the writer has employed is this: simply canning the milk as one would can fruit. Fill glass jars and screw down the lids, then place them in a steamer over cold water; heat the water gradually and steam the jars for an hour, then tighten the tops. I have never kept milk so treated for more than a week, but see no reason why it should not keep much longer.

Sour milk. However, if you find yourself with sour milk on your hands, do not throw it away, it has many uses.

Buttermilk is also very valuable to the housewife; it can be kept a long time in good condition for mixing doughs by covering with water, which must, however, be often changed for fresh.

USES FOR SOUR MILK AND BUTTERMILK.

Bonny clabber. Put skimmed milk into a glass dish or into teacups and set away until it becomes solid, then eat with sugar and powdered cinnamon sprinkled over it.

Cottage cheese. Set thick sour milk where it will heat gradually till the curd separates, then pour into a bag and let it drip till dry. Salt well, and add a little cream or milk and melted butter.

Buttermilk. 1. As a drink. For this it should be very fresh.

2. Buttermilk soup.

Uses of both. Both buttermilk and sour milk can be used:

1. In making soda biscuit dough.
2. In pancakes of all kinds.
3. In corn bread.
4. In some kinds of cake, as in gingerbread, cookies, and doughnuts, where they are by many cooks preferred to sweet milk; and in almost any kind of cake sour milk may be substituted for sweet, remembering always to use only half the quantity of cream of tartar called for in the recipe.

FATS AND OILS.

The third food principle, fats, stands between the two great nutrients, proteids on the one hand and carbohydrates on the other, and we find that we can indulge in considerable latitude as to its use. When we wish to get our food in a more condensed form, we can use fats freely in connection with proteids and lessen the amount of carbohydrates. In army dietaries the amount of fat is largely increased for marching, and for great exertion the amount becomes three times that allowed in garrison life. For instance, the daily rations served out to the German

soldiers in France during the month of August, 1870, contained

	Proteids.	Fats.	Carbohydrates.
Army dietary.	157 gms.	285 gms.	331 gms.

It was represented by one pound and ten ounces of bread, about one and one eighth pounds of meat, and over one half pound of bacon, besides an allowance of coffee, tobacco, and wine or beer. Professor Ranke has called this an admirable diet for fighting men. In garrison life these soldiers would have received only 56 grams of fat and 120 grams of proteids, while the carbohydrates would have been increased to five hundred grams or more.

On the other hand, fat when coupled with enough carbohydrate food can replace some of the proteid, and often does so in the food of hardy and economical people. The Bavarian woodchopper is enabled by his splendid digestion to arrange his diet in the following way: he takes little proteid from the animal kingdom, but in order to get enough of it from vegetable products, he must, as we know, take in an immense quantity of the starch associated with it, and to this he adds a great quantity of fat. Von Liebig says that such a man takes on the average

Diet of Bavarian woodchopper.

Proteid	Fats.	Carbohydrates.
112 gms.	309 gms.	691 gms.

We see therefore that we can have a sliding scale for fat; that while we should not go below two ounces a day, we may, in case we lower one or both of the other two great constituents, go up to eight or nine ounces.

Importance of fat not realized.

People belonging to the well-to-do classes, unless they have given special study to the subject, seldom realize the importance of fat in our economy. Fat means to them fat meat, suet, lard, and the like, and much eating of these is considered proof of a gross appetite; they do not consider how much fat they take in eggs, in milk, in grains like oatmeal and maize, in the seasoning of their varied dishes, and in their well-fattened meats, where, as in an average piece from a very fat mutton, they eat twice as much fat as proteid without knowing it.

Indeed, a well-fed man of the upper classes may have more fat in his daily diet than has the freshly arrived Mechlenburg laborer

who spreads a quarter-inch layer of lard on his bread. The latter cannot take his fat in unsuspected forms; he craves this principle with his plain vegetable diet, and must take it as he can get it.

Now let us understand that where economy is to be considered, this question of fat does not take care of itself as it does for the rich man. The economical housewife should always keep in mind that she must furnish her family enough fat, and furnish it cheaply.

Substitutes for butter.

Butter is a dear fat; count out the water in it and see what it costs you. We must economize in butter in as many ways as possible. We must eat more fat meat, first, that which is ingrained with the lean where it takes the place of water, as we have seen under "Proteids," costing us practically nothing; when we eat our vegetables seasoned with such a piece of meat, we find them sufficiently seasoned. We must also eat more of fat meat which we recognize as such, taking pains to cook it so that it will be palatable; the crisp, brown outside of a roast is always welcome, but the fat of boiled beef or mutton will also be relished if served very hot. An excellent selection in low-priced beef is the fat middle rib; the lean part is very tender and juicy when cooked in water at a low temperature for two or three hours (or in heat saver, see page 226, for three or four hours) and the fat, if served hot, any but a pampered taste will relish. Too much cannot be said in praise of pork as furnishing a good-tasting and cheap fat; it can be cooked in many ways and used to flavor vegetables, etc.

Digestibility of fat.

It is consoling to the economist to know that little of this food principle will be wasted in the body. Fat is more completely absorbed, according to the testimony of the experimenters, than any other kind of food, even meat.

We want to say a few words as to the character of different animal fats, and then we are done with this subject. All the fats consumed by us, without exception, are composed of three bodies called neutral fats, mixed together in varying proportions. These three bodies are "olein," "palmatin" (margarin), and "stearin," and the chief difference between them is that they melt at different temperatures; the more olein a fat has, the more easily it melts, and the less it has the more it is like tallow. In

vegetable oils we find, in addition to these, small quantities of what are called "fatty acids," and in butter we have beside the three common fats a small per cent of four scarcer ones.

Fats compared.

Practically, therefore, all fats are alike, and when absorbed they do the same work in the body, their varying flavors and their colors having nothing to do with this. However, their flavor, their appearance, and the ease with which they melt in the mouth and in the digestive tract have much to do with our estimation of them as foods. Mutton fat will do our body the same service as butter, but because of the relatively small amount of olein it contains, we have difficulty in swallowing it.

As to the comparative digestibility of these fats, it is generally admitted that those which melt at a low temperature, like butter and vegetable oils, are most readily taken up by the system; it is thought that we could digest beeswax if it would melt in the stomach. Still, although butter stands in common estimation as the most digestible as it is the most palatable of the fats, the stomach finds no trouble in disposing of reasonable amounts of any fats used in the household.

Artificial butter.

The fact that all fats are so similar in composition and that if once digested they will do the same service in the body, first led scientists to try to make out of the cheaper fats a substitute for butter. It was Napoleon III, who set the chemist Mège-Mourier at work to discover an artificial butter for use in the army. This chemist added butter colors and flavors made in the laboratory to olein and margarin extracted from beef suet and mixed with this a little real butter, and so successful was the result that the making of artificial butter has become a great industry. Now certainly no one objects to artificial butter on the ground that it is made of animal fats, for he eats these every day on his table; he objects because he has doubts as to the cleanliness or the healthfulness of its method of manufacture.

Therefore, since the substitution, to some extent, of animal fats for butter is from an economic standpoint so desirable, if we cannot bring ourselves to use oleomargarine we must do the best we can in these kitchen laboratories of ours to make other fats than butter acceptable to the taste.

USES OF FATS.

Beef suet. Its uses.

Beef suet has many uses. It should be bought perfectly fresh, that surrounding the kidneys being chosen as of the best quality. Chopped fine it is used in suet puddings, and may be employed to enrich other puddings made of skimmed milk, as a rice pudding; it combines well with bread crumbs in any hot dish, in bread puddings, bread stuffing, bread omelet, and soup balls. In all cases it must be chopped fine and cooked sufficiently to fully incorporate it with the other materials. Suet may also be used in many flour dishes instead of butter, if they are only cooked long enough and eaten warm; also in all cake where molasses and spices or any strong flavor is used.

Marrow.

Every bit of marrow in bones should be scraped out and carefully used. Its taste is more delicate than that of suet, and it can be substituted for butter even in fine cake.

Butter tried out.

Whatever butter you use in cooking should be *cooked* butter, which may be prepared when butter is cheap and put away for winter use. So prepared it will keep as long as lard.

A second quality of butter may be used for this, or that which is beginning to be rancid; if already so, add one fourth teaspoonful soda to each pound, but such butter when tried out will not keep as long as that made from sweet butter. In trying out butter great care must be taken not to burn it. Put it in a large iron kettle and cook it down very slowly until you no longer hear the sound of boiling; it will then begin to froth and rise, and this is a sure sign that the process is completed. Set the kettle back to cool a few moments, then skim and pour off the butter from the dregs into jars. Keep in a cool place and closely covered. In any recipe use one fourth less than of fresh butter.

Tried out suet.

This should be done with even more care to avoid the tallowy flavor. Exact directions are given in "Cooking Methods," page 224. The "scraps" are often relished by children. This beef fat (which we decline to call tallow) should be put away in cakes in a jar closely covered.

To use.

To use it, scrape it fine, sprinkling a little flour in it to keep it light. So prepared it may be used in any of the ways mentioned under "suet," and to this list still

others may be added, since it does not need, as does suet, long cooking in order to mix it well with the other ingredients of the dish. It can be used successfully in warm breads of all kinds, and in all but the nicest cakes if mixed with one half butter.

Lard. Much of the lard now furnished is so poor, that unless one pays a high price to a well known dealer, it is better for each housekeeper to buy the leaf lard and try it out herself. Cut fine and cook all the water out, taking care not to burn. The "scraps" are even better than those left from suet and should by no means be thrown away.

SAUCES FOR MEAT AND VEGETABLES.

The economical and busy housewife says she has no time nor money for sauces, but the fact is she cannot afford to do without them. All vegetables must have some fat to season them, and to use butter in every case is extravagant and gives no variety, while a cheaper fat if made into a sauce with flour and water can be flavored in a dozen ways.

DRAWN BUTTER SAUCES.

Drawn butter, which is the foundation of most of the sauces, is thus made:

Plain. A heaping tablespoonful of butter or beef fat is put into a saucepan; when it boils, one heaping tablespoonful flour is added and stirred as it cooks. To this add gradually one pint of water, one teaspoonful of salt, and one fourth teaspoonful of pepper. If you wish to unite economy and good flavor use one half tablespoonful of beef fat in making the sauce, and add one half tablespoonful butter cut in small pieces just before serving.

Milk sauce is the same, made with milk instead of water. In brown sauce, the fat and flour are stirred till they brown, then make as above. Any number of sauces can be made from these three by adding different flavors; chopped pickles and a tablespoonful of vinegar are added to No. 1 when it is to be used on fish, or mustard for mustard sauce. The addition of eggs raw or cooked makes another variety.

Milk gravies. With the help of milk we can make a gravy as in "milk sauce" with beef or pork fat, seasoning with salt and pepper and perhaps some powdered herb. Children like all these gravies, if nicely made and flavored, to eat on bread as well as on vegetables.

MEAT SAUCES.

A few cheap sauces for meats alone deserve special mention.

Mint sauce. Two tablespoonfuls of green mint or spearmint chopped, one tablespoonful sugar, one half cup of vinegar. Mix and let stand an hour or two.

Tomato sauce. Boil one pint of fresh or canned tomatoes with a little onion, salt, and herb flavoring until quite thick, then strain, and add one teaspoonful of flour cooked in a teaspoonful of butter.

Fruit sauce. Any sour fruit, as apples or plums, makes an excellent sauce to eat with meat. Apple sauce goes especially well with pork.

Horseradish sauce. Add to drawn butter or any meat gravy one half cup grated horseradish. Simmer a few minutes.

CARBOHYDRATE-CONTAINING FOODS AND THEIR PREPARATION.

We are now to furnish for the body the third great food principle, the carbohydrates. These we mean when we speak of the starches and sugars, and with unimportant exceptions they are furnished by the vegetable world only.

Cellulose. As we have seen, that troublesome body, cellulose, plays here a large rôle. It is the skeleton, so to speak, of plants, built by them out of sugar and starch; the chemist finds no difficulty in his laboratory in turning it back into dextrin and sugar, and our stomachs too can digest a large part of the cellulose of very young and tender plants, — from 47 per cent to 62 per cent, it has been found, of young lettuce, celery, cabbage, and carrots, — but in older plants, the cellulose

proper becomes all intergrown and encrusted with substances of a woody and mineral nature, from which even the chemist separates it with the greatest difficulty, while our digestive juices are entirely unequal to the task. Therefore it is that the whole art of the cook is needed in treating this substance; she must soften it, she must break it up, and in many cases separate it as completely as possible from the sugars, starches, and proteids which it hinders us from appropriating to our use.

Its use.

In some cases, as in oatmeal and graham flour, we leave the cellulose because of its mechanical action on the bowels. To be sure, this is a wasteful process, for the cellulose carries with it when it leaves the body considerable undigested food, but better this waste than to give the muscles of our intestines so little work to do that they become unable to digest any but fine, condensed foods. As a rule, however, we must think of cellulose not as a food at all, but as a tough, foreign body which we must reckon with before we can utilize the proteid and starch particles of many important vegetable foods.

Amount of carbohydrates.

The carbohydrates, especially the starches, are the cheapest of the food constituents, and therefore most apt to be in excess, especially in the food of the poor. According to estimates already given, an adult at average hard work gets along nicely with one and one eighth pounds of carbohydrate material (meaning, of course, the dry amount of this one principle), though fortunately, as mentioned under "Fats," it is found that some of this large amount can be exchanged for fat, if the body, for any reason, can better use the latter. Brain workers and the richer classes the world over, take less of carbohydrates, at least in their starch form, and more proteids and fats.

Inasmuch as we get these carbohydrates from the vegetable kingdom, and because the housewife must furnish them combined with other principles, as in bread and other things made of flour, and in various dishes in which vegetables are combined with meat, milk, eggs, etc., we will cease speaking of carbohydrates as such, and will give a few hints as to how to prepare vegetable foods so that we can get the most out of them, bearing in mind, however, what has been said about not following out this principle to the extent of weakening the bowels.

To what extent digested.

This leads us, first, to examine the general digestibility of the whole class of vegetable foods; meaning by this, not the rapidity nor the ease, but the *extent* to which the nutritive principle is yielded up to us. It has been found that, as usually prepared, vegetable foods give up to us from one fourth to one half less of their nutrients than do animal foods, and especially is this true of those that are rich in proteids. To illustrate: a workman eats as part of his dinner a dish of boiled beans, but though he rightly considers that he has been eating a nourishing dish, he has really absorbed only 60 per cent of the nitrogenous substances contained in it, the other 40 per cent passing from him unused because of its intimate connection with the cellulose; at least this was the case with Prof. Strümpell, who records the results of personal experiments on the digestibility of beans cooked whole. Now this workman digested of the meat part of his dinner 97½ per cent, and this comparison shows how the tougher kinds of cellulose interfere with the absorption of the food matters which they inclose.

The starch part of vegetable food we seem to get out much better than the proteid part, even with our ordinary methods of cooking; thus out of cooked rice we get almost 99 per cent of the starch, but only 80 per cent of what proteid it contains; flour in the form of noodles and macaroni yields up 98½ per cent of its starch and 80 per cent of its albumen — in the form of bread a little less of each. The potato will give us only 75 per cent of what little proteid it contains, but as high as 92.5 per cent of its starch.

Effect of too much starch in the diet.

Although the starch-containing foods are cheap, and although they yield up a good per cent of this nutritive principle, they must not be used to excess, for the following reason: Starch must first be turned into sugar by our digestive juices before it can be taken up into the blood, and if the stomach is given more at a time than it can master, certain fermentations may take place, and digestion be influenced. The best authorities say that without doubt the continued and severe diarrheas of small children are due to the fermentation of starch foods for which their digestive organs are not yet ready. These fermentations, the irritating action on the

bowels of too much cellulose, and the loss of a good deal of proteid substance connected with it form the shady side of a vegetable diet. Even the ox, with his many stomachs, gets out of grass and unchopped hay only 60 per cent of the proteid and 50 per cent of the fat contained in it.

VEGETABLE PROTEIDS.

Even in our part of the world two thirds of the proteid food of most people is taken from the vegetable kingdom, and in order to choose our food profitably, we must know where to look for vegetable proteids, and how to fit them for eating. Here the cereals and the legumes are our friends, the former furnishing from 7 to 14 per cent in their dried state, the latter giving the astonishing figure of 20 to 24 per cent; or as much as meat.

GRAINS.

The cereals or grains, though containing much less proteid than the legumes, are more valuable to us because of their excellent taste, their availability to the cook, and the readiness with which when ground they yield us their nutrients. Since the grains are such important foods, a table is appended showing the average richness in food principles of those in common use among us. We find that different analyses of the same grain differ greatly from one another, barley for instance, ranging from 8 to 18 per cent in its proteid, and this may account for a certain grain being popular in one country and not in another. In our country we are especially fortunate in the cheapness and excellence of at least two of the grains, wheat and Indian corn. The first has, of course, much higher food value, but the latter is so cheap, and can be so easily cooked, that it is a blessing to the poor. The large per cent of both proteids and fat in oats is to be noted, justifying as it does the high esteem in which they are now held among us. At the other extreme is rice, the poorest of the grains in both these principles, but its almost perfect digestibility renders it very useful.

Wheat and Indian corn.

Oats.

Rice.

ANALYSIS OF GRAINS.

	Per cent proteids.	Per cent fats.	Per cent carbohydrates.	Per cent water.	Per cent cellulose.
Fine wheat flour	10.00	1.0	75.20	13.	0.3
Rye flour	11.50	2.0	69.50	14.	1.5
Barley grits	11.00	1.5	71.50	15.	0.5
Oat grits	14.50	6.0	65.00	10.	2.5
Buckwheat flour	9.50	2.0	72.50	14.	1.0
Corn or maize flour	10.15	4.8	68.45	14.	2.6
Rice grains	8.00	1.0	76.50	13.	0.5

SUGARS.

Most people would class sugar among the luxuries, and indeed we are best acquainted with it in those combinations with fruit, eggs, butter, and various flavoring matters, which, as puddings, pies, cakes, custards, etc., make up our dessert list.

Food value. Our first concern, however, is with its food value. It gives us the high figure of 99 per cent of the third food principle, carbohydrates. That is, it must be put in the list with bread and it can be used to a certain extent instead of bread and other starch foods. Moreover, it is especially fitted for a food in cases where nourishment is needed immediately, as it is digested or absorbed into the system almost as quickly as water and without taxing the digestive organs, and perhaps on this account is its consumption so great in our country; we live fast, and we want our nutriment in a condensed form.

But on account of its cost and because we are able to take only a moderate amount at a time, sugar cannot to any great extent take the place of the starches; we are to value it chiefly for

Its chief value. the relish it gives to other foods. As a flavor, it is of the greatest value, but if we prize variety we are certainly accustomed to the taste of sugar in too many dishes, as in rice, custards, and various egg and bread dishes, which the foreigner would sometimes salt instead of sweeten, and eat with his meat instead of at the end of the meal.

We would suggest that when we do use sugar, as in a pudding for instance, that we use less of it than we are accustomed to do, for in that case we could eat enough of a dish so flavored to make it furnish more of the real substance of a meal.

BEANS, PEAS, AND LENTILS.

Per cent of proteids.

Look again at the remarkable per cent of proteid given by this class of vegetables. Beans and peas, 23 per cent; lentils, 25 per cent, while beef gives on the average only from 17 to 21 per cent. By people who from choice or necessity live principally on vegetables, the legumes have always been largely used; their consumption is extensive in India, China, and in all of Europe.

To be sure, the quality of the proteid is not the same as in meat, — it is less stimulating and palatable, and perhaps in other ways inferior, — but the proteid needs of the body can be answered by it, and that is a very important item when the question is one of economy.

Digestibility.

The impression that dried beans and peas are "hearty" food, fitted for out-door workers rather than for less vigorous people or those of sedentary habits, seems justified by the fact that these vegetables contain an unusually large per cent of cellulose of the tougher sort which requires a long-continued application of heat to free it from the proteid and starch of the vegetable; indeed, unless it is broken fine or ground into flour, cooking, however long continued, will be insufficient. We have seen that Professor Strümpell digested only 40 per cent of the proteid of beans cooked in the ordinary way, but when they were ground to flour and baked he digested 91.8 per cent. The fact is we could cook and eat our wheat whole much more easily than we can our beans, and yet bean flour is not in the market, if we except the "prepared" sort in small, expensive packages. It seems that the best we can do is to cook beans well and sieve them; in that way we free them from the skins at least.

Cellulose.

Bean flour.

Split peas.

The dried and split pea, though as valuable as the bean and already freed from the skin, is not as much used among us; it should be more employed in soups and as a vegetable.

Lentils a few years ago were to be found only in large cities, now they are more easily attainable. Their food value, as we have seen, is still greater than that of beans and peas, but the taste is not as agreeable until one becomes accustomed to it. An economist cannot afford to neglect the legume family.

POTATOES.

We in our country need not feel as bitter against the potato as do the scientists of Europe, for we are not obliged to use it to excess, and considering its cheapness and availablity it is for us a good vegetable and on these accounts, though it makes a poor enough showing as to food value, we must rank it next to the bean in importance. It has only 2 per cent of proteids, no fat, and only 20.7 per cent carbohydrates, and yet since it can be prepared in so many ways and we never tire of its mild flavor, it will doubtless continue to come upon our tables more frequently than any other vegetable. But every day or twice a day, in large amounts, is far too often ; indeed those who use it to this extent must be ignorant of its relatively low food value. The quality of the potato is of great importance and none but the best should be used. It should be a mealy variety and perfectly ripe.

GARDEN VEGETABLES.

Green vegetables, excepting the pea and bean, are not to be valued chiefly for what we can reckon up in them of proteids, fats, and carbohydrates, for the amount is very small. Except in the height of the season, they must be looked on as luxuries, but we will buy them as often as we can afford them. In quantities sufficient to flavor soups and stews they can always be afforded, and in this way should be freely used, carrots, celery, parsnips, and tomatoes for example.

FRUITS.

Our markets offer us a great variety of fine fruits, and many of them are cheap in their season ; apples in the fall are within the reach of the very poorest.

Fresh fruits have a large per cent of water, as high as 89 per cent in the orange, and few fruits have less than 80 per cent.

Their food value is mainly in the form of sugar, apples giving us on an average 7.7 per cent, grapes, 14.3 per cent; of proteids, the amount does not, with the single exception of the strawberry, reach 1 per cent; but fruits are very useful to us on account of their flavor, due to various aromatic bodies, fruit acids, and sugar. The apple is especially valuable on account of its cheapness and fine keeping qualities, and is used in a variety of ways by the cook to give a relish to plain materials. Although our largest use of them is in sweet dishes, they are perhaps quite as valuable used without sugar; they may be fried in slices and eaten with fat meat, as bacon or sausage, or they may be used to stuff a fowl.

Fruit is not for all people easy of digestion if eaten in considerable quantities, and this is partly on account of its relatively large per cent of woody fibre, and also, especially when not quite ripe, because of the acids and pectose contained in them. Huckleberries have 12 per cent woody fibre, apples only two per cent, including the seeds and skin.

The importance of dried fruits as food is not well enough understood. Fruit loses in drying a large portion of its water, leaving its nutritive parts in more condensed form for our use; dried apples are very near to bread in the per cent of nutrients they offer, and the dried pear may be called the date of Germany, so general is its use. With us this fruit is too expensive, but in parts of Germany the writer has seen dried pears commonly exposed for sale by the barrel like beans; they are eaten in great quantities by the common people, who seem to digest them and dried apples without any trouble, accustomed as their stomachs are to a rye bread and vegetable diet. These dried fruits are made into a variety of dishes with meats, with potatoes, and with beans, and also with noodles and macaroni.

COOKING OF GRAINS.

The grains may be cooked whole, coarsely ground, as grits, and finely ground, as flour.

Grains cooked whole.

All these grains can be cooked whole, but it is seldom done, because of the length of time required. Only rice and barley are generally so cooked.

Rice. To cook. In cooking rice the aim should be to have the grains distinct from each other, soft, dry, and mealy.

Steamed. This is the best way. Add to the rice three times its bulk of water, salt well, put in a covered dish in a steamer and steam one half hour. Or, the rice may be soaked over night, and it will then steam soft in twenty minutes.

Boiled. Put the rice into a large quantity of boiling water, add one teaspoonful salt to each cupful of rice; boil fast, stirring occasionally. Drain, dry out a little, and keep warm by covering with a cloth, as is done with potatoes. Save the water poured off for soup.

Rice. To use. Its best use is as a vegetable with meat. Being of a bland and neutral character, it can, like bread, be made into an endless number of dishes to be eaten with meats, or into dessert dishes, with sugar, fruits, etc. For rice omelet see page 238; rice pudding, see "Simple Sweet Dishes." Grated cheese is a good addition to rice, supplying its lack of proteids and fat.

Pearl barley boiled. Soak all night and boil soft in salted water. It may also be steamed. Use as a thickening for soups, or like rice, as a vegetable, or as a breakfast dish with sugar and milk.

With prunes. It is excellent mixed with its bulk of stewed prunes; pour over it melted butter, sugar, and cinnamon.

GRAINS, COARSELY GROUND, OR GRITS.

These are better adapted to simple cookery than are fine flours, since to make them eatable it is only necessary to cook them soft in water. The grains used in this way among us are cracked wheat, farina or wheat grits, oatmeal, hominy, and corn meal, and they are all cooked in nearly the same way.

MUSHES.

Wheat, oat, and corn mushes. Time, two to three hours. This time may be shortened by soaking the grits some hours in water. Oatmeal and corn cannot be overcooked.

Amount of water: They all, except corn, absorb from three to four times their bulk of water; corn, a little over twice.

Salt: One teaspoonful to one cupful of grits.

Method of cooking: Steaming is best, as there is then no danger of burning or of making the mush pasty by stirring. Put the grits and four times their bulk of water into a double boiler or into a dish, and set the dish into a steamer, or use a tin pail with tight cover, and set in a kettle of water; any way to keep it at boiling heat without burning.

Uses for cold mushes.

Porridge. Stir any cold cooked mush smooth with half water and half milk to the consistency of porridge. Add a little salt, and boil up. Sugar and cinnamon or nutmeg may be added as flavor. Of course porridges can be made of the uncooked grits; they are simply very thin mushes.

Pancakes. One cupful of cold oatmeal, hominy or corn mush, two cupfuls flour, one half pint milk, one half teaspoonful salt, and one egg, two teaspoonfuls baking powder, or one of soda and two of cream of tartar. Or, sour milk may be used with one teaspoonful soda, omitting the cream of tartar. These mushes will differ a little in thickness, and therefore more or less flour may be needed. Bake on griddle.

Muffins. The same mixture as above, with the addition of a little more flour. Bake in muffin rings.

To fry. For this, only corn mush and hominy are commonly used. When cooking, add a handful of wheat flour to the mush to make it stiffer. Pack while warm into a square mold, and when cold cut in slices and fry slowly to a nice brown on a griddle with a little fat. Or, the slices may be dipped into beaten egg, then into bread crumbs, and fried in boiling fat.

CORN FLOUR.

There is one fine flour that can be treated in the same way as the coarsely ground, — that made from Indian corn. Perhaps on account of its larger per cent of fat, and because little of its albumen is in the form of gluten, it does not form into a sticky paste as does wheat flour, but can be mixed with water only, and then boiled or baked into digestible and good tasting food, and this is one thing that makes corn so valuable a grain to people like the negroes of the Southern States, whose cooking apparatus is of the most primitive sort. Corn meal has one peculiarity — it quickly sours, and should be kept no longer than a week. The kiln-dried meal, however, keeps indefinitely, and is now largely

used, but is not as sweet as the freshly ground. The name "meal" seems to be used for both the fine and coarsely ground.

Corn mush. This, whether made from fine or coarsely ground corn, is cooked like grits. (See page 255.)

Hoe cake or corn pone. One quart Indian meal, one teaspoonful salt. Moisten to a dough with boiling water or milk; let it stand a few hours till it shows air bubbles on the surface, then make into thick cakes and bake in the oven, or cut in slices and fry in pork fat on a griddle. Break, not cut, and eat hot.

GRAHAM FLOUR.

This preparation of wheat, though finely ground, may be treated somewhat like grits, and a bread may be made of it with the addition of water only, which will be light and palatable. The secret of success is in having the oven very hot.

Graham gems. Mix salted graham flour with cold water to a batter thick enough to drop, then put it into iron forms already heated, and bake in a *very* hot oven for about fifteen minutes.

FINE WHEAT FLOUR.

Flour may be cooked, of course, in boiling water or milk, and in this way is used to thicken gravies or soups, and also to make a sort of mush with milk and eggs.

The principle of cooking it in this case differs not at all from the cooking of a potato; in both cases the starch granules soak up the hot water till they burst their cellulose walls. But if we were to try to *bake* flour when wet up into a thick paste, we would find it, in the first place, difficult to accomplish, the heat being very slowly communicated from the surface to the interior, and when done, we would have only a tough, indigestible mass. There is, however, one way of preparing such a paste for cooking, which we will consider before treating the "raising" of flour for bread. Flour dough is in this case kneaded hard, rolled thin, and then dried. So treated we know it in the form of

MACARONI AND NOODLES.

Macaroni. A trade article extensively used abroad, where the best kinds cost only ten to twelve cents a pound, and the broken

or imperfect sticks not more than seven. It is a valuable article of food, but its use will not become extensive among us while it is so dear. Like the fine flour of which it is principally composed, it is deficient in fat, and must be eaten with the addition of butter, cheese, or milk.

How cooked. Put into plenty of salted boiling water, and boil twenty or thirty minutes, till it is perfectly tender (if old it takes longer to cook). Drain carefully, pouring it into a colander or lifting out with a skimmer.

To use. 1. (Best). Put it in the dish in layers with grated cheese and butter.

2. Serve with milk and butter sauce.

3. Add two beaten eggs to the milk and butter sauce.

Other uses. Like bread and rice, macaroni when cooked is made into a great number of dishes; it is added to soups, it is mixed with meat in ragouts, and it is cooked with certain vegetables, as tomatoes.

With tomatoes. Arrange the macaroni in a pudding dish in layers with grated cheese and stewed tomatoes. Brown in the oven.

Noodles. This is also a trade article, but that of home manufacture is much better. It may be called one of the German national dishes, so extensive is its use among that people, with whom it often constitutes the main dish of a meal without meat.

Ingredients: Three eggs, three tablespoonfuls milk or water, one teaspoonful salt, and flour. Make a hole in the middle of the flour, put in the other ingredients and work to a stiff dough, then cut in four strips, knead each till fine grained, roll out as thin as possible, and lay the sheet out to dry. When all are rolled, begin with the first, cut it into four equal pieces, lay the pieces together and shave off very fine as you would cabbage, pick the shavings apart with floured hands, and let them dry a little.

To use: Boil them, a few at a time, in salted water, taking them out with a skimmer and keeping them warm. Strew over them bread crumbs fried in butter, or use like macaroni. (See page 257.)

These noodles will keep indefinitely when dried hard; therefore, when eggs are cheap they may be made and laid up for the winter. The water in which they are boiled is the basis of noodle soup; it needs only the addition of a little butter, a tablespoonful of chopped parsley, and a few of the cooked noodles. Experimenters have proved that flour in the form of noodles and macaroni is more perfectly digested than even in bread.

BREAD MAKING.

Principles involved.

So far we have used in the cooking of flour no other principle than the simple application of water and heat. We must now consider how fine flour is to be made into what is known as bread. As before said, the particles easily pack together when wet into a pasty dough which, if so baked, would defy mastication and digestion. We must contrive in some way to separate these flour particles by forcing between them air or some other gas, so as to present as large a surface as possible to the action of the digestive juices and this may be done first, by surrounding these particles by fat, as in making pie crust; second, by the air contained in beaten egg; third, by forcing carbonic acid gas through the mass by the action of (*a*) yeast, or (*b*) of bicarbonate of soda acting on some acid.

FLOUR RAISED WITH FAT.

Pie crust.

The familiar example of this method is pie crust, where a paste of water and flour is repeatedly rolled and spread with some fat, as lard, until the paste is in paper-thick layers with the fat between. When baked, the air expands and separates the flour particles, a true lightness being the result. So much fat must be employed to produce this result, however, that the use of this method will of course be limited to the construction of dessert dishes, of which not much is eaten at once. A flour rich in starch is better for this purpose than a gluten flour.

FLOUR RAISED WITH EGG.

The next most simple method of cooking fine flour is to introduce between its particles the air adherent to beaten egg, and by

the immediate application of heat to expand the air and stiffen the mass thus aerated. By this method none of the food principle is wasted as when yeast is used, nor is a chemical salt left in the dough as in the action of soda, but the method is expensive and is limited in its use to what may be called fancy breads and cakes. We have selected the following mixture as the foundation for egg breads; of course others are possible:

Foundation of egg breads. One quart of milk, three eggs, one tablespoonful butter, and one teaspoonful salt. This mixture is then thickened with any kind of flour, or with part flour and part bread, boiled rice, boiled hominy, or corn mush.

To mix: First beat the eggs very light, whites and yolks separately, then the yolks smoothly with the flour and milk, stir the whites in at last very lightly and bake immediately. The eggs must be beaten *very* light and the batter just of good pouring consistency, thinner than if no eggs were used.

Wheat, graham, or corn pancakes. Add to above foundation mixture a scant pint of either of these flours.

Cooked rice, hominy, or corn mush pancakes. Add to the foundation mixture one cupful of flour and two cupfuls of boiled rice, hominy, or corn mush (or the proportions may be reversed). Bake in small, rather thick cakes. If they stick to the griddle add a little more flour.

Bread pancakes. Add to the foundation mixture, one cupful of flour and two cupfuls of bread crumbs that have been soaked soft in milk or water and mashed smooth. The batter should be rather thick. Bake in small cakes, adding more flour if they stick.

Muffins and waffles. Muffins and waffles of all sorts are made like pancakes, but a little stiffer with flour.

Other egg doughs. Other egg-raised doughs, mixed in somewhat different proportions and differently cooked, as fritters, sponge cakes, and batter puddings, will be found in another section.

FLOUR RAISED WITH CARBONIC ACID GAS.

This is brought about by (*a*) the growth of the yeast plant, or by the action (*b*) of bicarbonate of soda on some acid. Both of these methods have their advantages.

Yeast.

The action of the yeast plant when brought into contact with flour and water is to develop carbon dioxide gas and alcohol. This it does at the expense of the little sugar already in the flour, but still more at the expense of that which it manufactures out of the starch, or, as some say, out of the gluten. The chemist ascertains this loss of nutritive matter to be as high as one per cent, and Liebig, who was strongly opposed to this method of bread raising, estimated that forty thousand people might be fed on the flour that was wasted in this way in Germany alone. But notwithstanding this waste, the method, on account of its convenience and the good taste it gives to bread, still holds its ground.

The time cannot be far distant when the baker will furnish us better and cheaper bread than we can make in our own kitchens. This has long been the case on the continent of Europe, but for some reason we have not yet reached that point in civilization and the housekeeper must still learn this art and practice it, for good bread is a necessity.

Quality of flour.

The best flour is, even for the poor, the cheapest, as it makes more and better bread to the pound. There should always be two kinds kept on hand, the yellowish, high-priced, gluten flour for bread making, and the whiter, cheaper sort for pastry, cake, and thickenings.

No recipe for yeast will be given, as the compressed yeast is so much better than the housewife can make and is now obtainable even in small towns.

To make bread.

Proportions: one quart of warm water, two and one half quarts (about) of flour, one tablespoonful salt, one tablespoonful or one cake of compressed yeast, or one half cup of liquid yeast. The proportions of flour and water differ according to the quality of the flour, the gluten flours taking up much more water than the starch flours.

Put the flour and salt into your bread pan and make a hole in the middle, then pour in gradually the water in which the yeast has been dissolved, mixing as you pour with your hand or with a spoon. As soon as the mass will hold together, take it out on a molding-board and with floured hands work it gradually into a tender dough, using as little flour as possible, for the dough must remain as soft as can be handled. This first molding should

take from fifteen to twenty minutes. Then let the bread raise in a warm place; the yeast plant can live in a temperature ranging from 30° to 170° F., but thrives best at about 72°. Cover with a cloth, and in winter keep by a warm stove. If made with compressed yeast, the dough will raise the first time in an hour. Take it at its first lightness before it begins to sink back (it should be like a honeycomb all through, and double or treble its original bulk), put it on your molding-board, or one half of it at a time, and mold it well until it is fine and tender again. Add no flour this time, but keep the hands moist with warm water or milk or with lard. Divide into loaves, small ones, which should only half fill the greased tins, and set again to raise, keeping it at the same temperature and letting it get very light again. Flour that is rich in gluten needs longer to raise than that containing more starch.

Baking bread.

It is difficult to give directions about the heat of the oven. One housekeeper says "hot enough so that you can keep your hand in till you count twelve," another, "until you can count thirty," and the puzzled novice can only inquire "how fast do you count?" The oven must be hot enough to brown the bread lightly in ten minutes, and to bake a small loaf in from twenty minutes to half an hour.

Additional facts.

If more convenient, a bread sponge may be made at first with the water, yeast, and part of the flour. and when light the rest of the flour added. It hastens the process a little.

How many times shall bread rise?

Do not let the bread raise more than twice; it loses each time some of its nutritive qualities. Bread raised *once* is coarse of grain but sweet to the taste.

To keep bread long.

Mold it harder than you do bread that is to be eaten soon.

Dough that has become chilled.

Set the bread pan immediately into a larger one filled with warm water, and as the water cools replace with warm until the dough begins to raise again.

Dough raised during the night.

This method is often convenient, and does very well if slower yeast is used, but bread is better to be raised quickly with compressed yeast. If the latter is used, a forenoon is sufficient for the making and baking.

To delay the baking of bread dough.

For convenience, as to make warm biscuits for supper, a rising dough may be kept at a standstill for hours without injury at a temperature of about 50°, as in a cellar, and an hour before baking brought into a warm room to finish the raising process.

BREADS FROM OTHER FLOURS.

Graham bread.

Graham bread is made like white bread, using two parts graham to one of white flour, or any other proportion liked, but it should be mixed very soft. A little sugar and fat should be added, one tablespoonful lard or beef fat, and two tablespoonfuls sugar or molasses. Bake slower and longer than white bread.

The usual and most convenient way of making graham bread is to mix the flour and other ingredients with some of the white sponge on baking day.

Rye bread.

Rye bread is made exactly as is bread from wheat flour, but in this country four parts rye, one part corn meal, and a handful of wheat flour are generally used. It must bake much longer, — two to three hours in a slow oven. It is still better steamed the first two hours and baked the third.

Corn bread.

Corn bread is made of three parts corn meal to one of wheat flour, same quantity of yeast and salt as for white bread, and an addition of two tablespoonfuls lard or beef fat and two tablespoonfuls sugar. It is only to be stirred, not molded, and need raise but once.

BISCUITS, BUNS, ETC.

Breakfast rolls or biscuits.

These are "little breads" of either white or graham flour. Make part of the dough out into little balls which will raise more quickly and bake in a shorter time, a little butter or lard, one tablespoonful to a quart of dough, being generally molded with it.

When called "breakfast rolls," the dough is made out into flat, round cakes, the top buttered and folded over not quite in the middle.

Milk rolls.

Milk rolls are made from bread dough mixed with milk instead of water; they are very tender and delicate.

Wheat gems or drop biscuits.

One modification in the baking of dough is worthy of mention. Use about a cup more milk in mixing the recipe for bread given above, so that the dough will just drop from a spoon and then bake in forms in the oven, or on a slow griddle.

Rusks.

These are made from bread dough mixed with milk and with the addition of four eggs and one cup of butter to a quart of milk. Form, long and high.

Other uses for rusk dough.

There are many uses for the above dough. When made out into biscuit shape it may be steamed and eaten as a simple pudding with fruit, or made into tiny balls and cooked, when light, in a meat stew, the dish being then called a pot-pie.

Buns, plain.

These are like rusks (above) plus two cups of sugar and a little spice, say one half teaspoonful nutmeg. Roll the dough out half an inch thick, and cut with a biscuit cutter. Let it raise till very light, which will take some time on account of the sugar.

Fruit buns.

To plain buns add one cup India currants, washed, dried, and floured, or raisins cut in bits.

Raised cake.

From the recipe for buns, as above, a plain and good cake may be made by using one pint instead of one quart of milk to the given quantity of eggs, butter, and sugar, and adding a little more fruit. Bake in a ribbed pudding dish which has been thickly buttered, and in the butter blanched almonds arranged in rows.

Doughnuts.

Bun dough may also be fried in fat, as doughnuts.

For a fine brown crust.

To give a fine crust to biscuit or buns: Brush over before baking with a feather dipped in one of these mixtures: one teaspoonful of molasses and milk, two teaspoonfuls of sugar and milk, or three teaspoonfuls sugar and the white of an egg.

To show the true relation of the above doughs to each other, the quantity has been kept the same as for bread dough, but one half the given quantity of cake, buns, or biscuit would be enough for a large family.

To steam bread.

Any of the above doughs can be cooked by steaming instead of baking, when more convenient. They will of course lack the brown crust, but may afterwards be dried

or browned in the oven. A somewhat longer time is required for steaming than for baking.

YEAST BREADS, — THIN.

Raised pancakes, wheat, graham and corn.

The materials for these are, one quart milk, or milk and water, a little more than a quart of flour, one tablespoonful compressed yeast or one half cup liquid yeast, one teaspoonful salt, one tablespoonful butter; the flour may be wheat flour, wheat and graham mixed, or wheat and corn mixed, or part bread crumbs may be mixed with the flour. Make and raise like bread sponge. It is better they should be too thick than too thin, as milk may be added to thin them after they are light, but raw flour added at that time spoils them.

Pancakes with eggs.

Add to the above batter, just before baking, one, two, or three eggs, yolks and whites beaten separately. Use in this case somewhat less flour.

Muffins and waffles.

These can be made of either of the above pancake batters, with one cup to one pint more flour.

BUCKWHEAT FLOUR.

Buckwheat flour makes bread that is relished by those accustomed to its somewhat peculiar taste, but in this country it is used only in pancakes.

Buckwheat pancakes.

One quart buckwheat flour, one teaspoonful salt, one cup or less of corn meal scalded in a little water, two teaspoonfuls molasses (to make them brown — a little buttermilk answers the same purpose), one tablespoonful compressed yeast, one quart warm water or enough to make a thin batter. Let raise over night.

FLOUR RAISED WITH SODA.

Soda.

On the interaction of bicarbonate of soda and different acids, by which carbonic acid gas is liberated, is based a common method of raising doughs. It wastes none of the flour as does yeast, but it has its own disadvantages. The product of these chemicals acting on each other is a salt which is left in the bread; hydrochloric acid acted on by soda gives common salt, to which there could be no objection, but this method is not easily used in the household, and the salt left by

other acids, as the lactic acid of milk when acted on by bicarbonate of soda, we get enough of in other dishes. Whether reliable experiments have been made as to the comparative digestibility of breads raised with soda and those raised with yeast the writer does not know, but there is a wide-spread impression that the former should be eaten only occasionally, and it is certain that we tire of them sooner than of yeast breads. Besides, which is of importance to one who must economize in milk, eggs, etc., better materials must be used with soda than with yeast to produce an equally rich tasting bread or cake.

METHODS.

We have three methods of using bicarbonate of soda to raise flour: by its action on

1. The acid contained in sour milk, from one to two teaspoonfuls of soda being used to a quart of milk.

2. On cream of tartar, the proportions being one teaspoonful soda to two of cream of tartar to a quart of flour.

3. On tartaric or other acids already mixed with it in a baking powder and to be used according to directions on the package, or, one may say in general that three teaspoonfuls of the powder go to every quart of flour.

Secret of success.

The secret of success in making soda raised breads consists in (1) the perfect mixing of the soda and cream of tartar or the baking powder, with the flour, cooks who are particular sieving the ingredients five times. In this connection we cannot urge too strongly that each housewife should make and keep on hand this prepared flour; in a leisure time she can measure, sieve, and mix it, and she has then in making biscuit or cake, only to chop in the butter, add the milk and eggs and it is done.

2. In light mixing of the shortening with the flour; this is best accomplished with a chopping knife.

3. In a rapid completion of the work after the two raising agencies have become wet and begun to work, and no delay in baking when all is ready.

Soda biscuits.

Ingredients: One quart of flour, one teaspoonful of salt, one tablespoonful of butter, or butter and lard, or butter and suet, one scant pint of *sweet* milk or water, with

one teaspoonful soda and two of cream of tartar, or three teaspoonfuls of baking powder ; or, one scant pint of *sour* milk with one teaspoonful soda and one teaspoonful cream of tartar ; if the milk be very sour, omit the cream of tartar.

To make ; In a chopping bowl stir all well together except the shortening and milk, then *chop* in the shortening, which should be cold and hard, till all is fine and well mixed. Now add the milk a little at a time, still mixing with the chopping knife. Take out on the molding-board and roll out with as little mixing as possible. This dough is often made richer, even one cup of butter to one quart of flour being used, but so much as this can only be considered extravagant and unhealthful.

As biscuit. To use this dough : Roll one inch thick, cut with biscuit-cutter, and bake. To be eaten warm with butter.

As graham biscuits. Use three parts of graham flour to one of wheat and treat in the same manner.

As shortcake. Roll one half inch thick, fit into jelly cake tins, and bake. When nicely browned, split and butter and pile up like toast. For fruit shortcake see page 270.

SODA BREAD OF CORN MEAL.

Corn bread or Johnnycake. 1. Plain. One cup of sweet milk, one cup of sour or buttermilk, or both of sour milk, one teaspoonful salt, one teaspoonful soda, one tablespoonful butter or suet or lard, three cups Indian meal and one of wheat flour, or all of Indian meal. Pour into a tin and bake forty minutes.

2. Richer. The same with an egg and one half cup sugar added.

3. Very nice. No. 1 with the addition of three eggs, one half cup sugar, and one third cup of butter, one cup of meal being omitted.

SODA RAISED BREAD — THIN.

Pancakes without Eggs.

1. Of wheat flour. Ingredients : One quart of flour, one teaspoonful salt, and one scant quart of sour milk, with two level teaspoonfuls of soda and the same of cream of tartar, unless the milk is very sour, when omit the cream of tartar. Sweet milk

can also be used with one teaspoonful of soda and two of cream of tartar, or three of baking powder.

To make: Mix the salt and cream of tartar, if used, with the flour. Make a hole in the middle and pour in the milk gradually, stirring with a spoon till smooth. Then beat hard for five minutes, or until it is bubbly. Add the soda dissolved in a teaspoonful of hot water, and bake immediately on a very hot griddle. Unless well beaten before the soda is added, these pancakes without eggs are not a success. If made with sour milk they will be still better if when mixed (without the soda of course) the batter is left to stand twelve or even twenty-four hours. Just before using add the soda dissolved in a little hot water.

2. Of graham flour. Are made in the same way, one part being of white flour and three parts graham.

3. Of corn meal. As above, with corn meal instead of graham.

Pancakes with Eggs.

Ingredients: To any of the three preceding recipes add two or three eggs, beating yolks and whites separately.

Muffins and Waffles.

Muffins and waffles of all kinds are the same as pancakes made a little thicker and with the addition of one tablespoonful of butter.

Fritters.

For fritters, which should be next in order, see page 274.

USES FOR BREAD.

These are so numerous that the housekeeper need never fear the accumulation of stale bread, if she will only take care of it in time. Every day the bits left from meals and the dry ends of

To dry bread. the loaf must be dried hard in the oven and then put away in paper bags. If time allows, pare off the crusts, cut into cubes, and dry separately to add to soups.

This dried bread will keep for weeks and months, — it must simply be kept clean and dry. In any recipe where bread crumbs

are called for, as bread pudding or bread omelet, use this dried bread, laying it first in cold water till it is soft, then pressing it dry in a towel and crumbling it lightly with the hand. Here are a few of the ways in which bread can be used.

USES FOR BREAD IN SLICES.

Toast. In dry toast, milk toast, and water toast, to be eaten as such and as a foundation for many other dishes.

Fried toast: Bread slices soaked in egg and milk, or water, and fried on a griddle with a little fat. Cold milk or water toast may be so used.

Fritters. For bread fritters see page 275.

Puddings. For bread and butter pudding see page 273.

Steamed bread. Stale bread may be cut in slices and steamed so as to taste sweet and good. Set the slices up on end in the steamer and steam five or ten minutes, then dry a little in an oven.

Bread re-baked. Biscuits of all sorts, even when several days old, may be made nearly as good as when fresh, by wetting the tops and setting in a hot oven for about five minutes, — a convenient way of having warm biscuits for breakfast.

USES FOR CRUMBS OR DRIED BREAD.

Soaked and crumbled as described on this page and used in bread dough instead of half the flour.

In bread omelets (see page 237).

In meat balls for soups and stews.

In bread dressing. Pour enough hot water on dry bread to soften it, and chop it not too fine; season with chopped onions, herbs, and suet or tried out fat. The addition of an egg is an improvement. Bake covered about an hour, then uncover and brown. This mixture may also be used for stuffing a fowl, leg of mutton, etc., or it may be fried in spoonfuls on a griddle and eaten with a sweet sauce as the simplest form of pancakes.

In bread pancakes (see page 265).

In bread puddings (see pages 271, 272, 273).

For breading chops, croquettes, etc., that are to be fried in boiling fat.

SIMPLE SWEET DISHES.

This department does not pretend to be complete; it simply aims to classify as many of the cheaper kinds as the ordinary family needs. These will generally be used as desserts, but there is no reason why the main dish of the meal should not have some sugar it. I remember that in a simple *pension* in Thuringia, Germany, I once ate of a dinner consisting of a soup, a salad, and one other dish which we would call a bread pudding. I was helped bountifully to this main dish of the meal, I ate and was satisfied, for the materials were good and it was well made and delicately baked. The recipe will be found on page 272.

MILK PUDDINGS.

Indian pudding. One quart of milk, one half cup corn meal, one teaspoonful salt, one half cup chopped suet, one tablespoonful ginger, one half cup of molasses. Bake covered for three hours in a very slow oven and serve with sweet sauce.

Swelled rice pudding. One quart skimmed milk, or one pint full milk and one pint water, one half cup rice, two tablespoonfuls sugar, one half teaspoonful salt. Bake slowly two hours covered, then uncover and brown. It will be a creamy mass and delicious in taste. Serve without sauce. Raisins may be added.

Minute pudding of wheat or graham flour. Ingredients: One quart milk, — skimmed milk with one teaspoonful butter will do, — two eggs, three fourths pint flour, one teaspoonful salt. To prevent burning, make in double boiler or pail set in a kettle of boiling water. Mix the flour and egg smooth with part of the milk, heat the remainder to boiling, and stir in the egg and flour. Stir till it thickens, then let it swell and cook slowly for fifteen minutes. Serve with fruit or with sugar and milk.

Farina pudding. Ingredients: One pint water, one pint milk, one teaspoonful salt, one half pint farina, two eggs. Make as above. This is excellent cut in slices when cold and fried brown on a griddle. It may also be made without eggs.

Buttermilk pudding. Ingredients: One pint fresh buttermilk, two tablespoonfuls cream or butter, a teaspoonful salt, a pinch of soda, and flour for stiff batter. Steam two hours, or till it

bursts open, or bake in little cups or patties. May be eaten with any fruit sauce or with milk and sugar.

FRUIT PUDDINGS WITH SODA BISCUIT DOUGH.

Strawberry shortcakes.

For this dough see page 266. When baked as shortcake split the cake and spread between each pair strawberries mashed and sweetened.

Other fruit shortcakes.

In the same way make shortcake of berries of any sort, stewed apples, stewed pieplant, lemon or orange tart filling, in short, any filling for a pie that is ready to eat without further cooking. These should be eaten warm but not hot, and are as good next day, if put in the oven long enough to become again warm and crisp.

Roly poly pudding and apple dumpling.

These favorite dishes are but modifications of the fruit shortcake. In the first the dough is made just stiff enough to roll out, covered with apples or berries or other fruit, then rolled up and put to bake in a pan containing a little water. For apple dumplings, the crust is cut in squares, sliced apples placed in the middle, then the corners gathered up and pinched together. Bake like roly poly pudding, or steam.

Apple pie.

If you wish to cook your fruit at the same time with the crust, fill a deep pie plate with fruit, as apples, and cover with the rolled out shortcake. Bake brown, and when done lift the crust, sweeten the fruit, replace the crust, and the "pie" is ready to serve. Raised biscuit or bun dough (see page 263), can be used in the same way; or, still better, yeast pancake mixture (see page 265), in layers with any sort of fruit. If you will call these fruit shortcakes "pies," and be content therewith, you will save much labor, much expensive material, and set before your family a more healthful dish. No farther recipes for pies will be given, a few that are generally classed as such coming more naturally under the head of puddings.

FRUIT PUDDINGS WITH BREAD.

1. Brown Betty.

Ingredients: One pint bread crumbs, or dry bread moistened, one quart chopped sour apples, one half pint sugar, two teaspoonfuls cinnamon, four tablespoonfuls butter or suet. Arrange bread and apples in layers in a pudding dish,

beginning and ending with the bread crumbs, seasoning each layer with the sugar and spice, and spreading the butter over the top. Cover it till the apples are soft, then uncover to brown.

2. Berry Betty. The same, made with raspberries or blackberries. If not juicy enough, a little water must be added. A pudding may be made in the same way with cherries or any other well flavored fruit.

CUSTARD PUDDINGS.

1. Plain. Ingredients: One quart milk, four eggs, yolks and whites beaten separately, four tablespoonfuls sugar, a grating of nutmeg, and a pinch of salt. Bake in a buttered pudding dish till solid, and take from the oven before it curdles.

2. Rice and custard. To above ingredients add one half cup of rice cooked soft in part of the milk, or in water. Bake one half to three fourths of an hour, till nicely browned. This is the foundation for the many varieties of rice puddings. Raisins may be added.

3. Tapioca. Tapioca and sago puddings are made in the same

4. Sago. way, except that they must be soaked for two hours in part of the milk or in water.

Indian and custard pudding. To the ingredients for plain custard pudding add one pint of corn meal and an extra cup of milk, one teaspoonful salt, one teaspoonful ginger, one fourth cup sugar, and one half cup chopped beef suet or two tablespoonfuls tried out fat. Scald the meal first in the milk, and bake the pudding, covered, two hours in slow oven.

BREAD AND CUSTARD PUDDINGS.

1. Bread pudding, or Semmel Geraüsch. One quart boiling milk poured on as much bread as will absorb it — about one pint if hard — four eggs, one half teaspoonful salt, one half cup sugar. The milk and bread are allowed to get cold and the other ingredients well beaten with it, the eggs being beaten separately, and the whites added last. Bake one hour in a buttered dish. Eat without a sauce. Of course a bread pudding can be made with fewer eggs, but then it will hardly do for the main dish of a meal.

2. Bread pudding (simple.) Dried bread soaked soft in cold water and pressed dry in a cloth, milk to make it into a soft mush. Add

one beaten egg to a pint of the mixture. Bake from half an hour to an hour, and eat with sweet sauce.

With raisins. Raisins or currants or fresh fruit, as cherries, may be added.

With dried apples. After putting in one half the pudding mixture, put a thick layer of stewed dried apples mashed and sweetened, and flavored with orange peel or cinnamon.

Bread and butter pudding. A convenient variation on the ordinary bread pudding.

Plain. Spread thin slices of bread with butter, and pour over them a simple custard, viz.: four eggs to one quart of milk, four tablespoonfuls sugar, a pinch of salt. Keep pressed down till the custard is absorbed: Bake slowly till firm and brown. Eat with or without sauce.

With fruit. The bread slices may be spread with India currants, or with any kind of fresh or dried cooked fruit, not too juicy.

Individual bread puddings. Cut small round loaves of bread into quarters, or use biscuits. Soak in a mixture of four eggs, whites and yolks beaten separately, and added to one pint of milk with a little sugar and nutmeg. When they have absorbed all they will without breaking, drain and bake in slow oven to a nice brown, spreading a little butter over once or twice at the last. This dish can be made very pretty by putting currants in the holes around the top and sticking in pieces of blanched almonds.

SUET PUDDINGS.

Ingredients: One half pint beef suet chopped fine, one half pint molasses, one half pint milk, one half pint raisins or currants, or both. (A part of the fruit may be figs and prunes cut in bits.) One teaspoonful salt, one teaspoonful soda mixed with the molasses, one pint bread crumbs (dry), one pint graham flour, and two eggs. Steam three hours or bake two. Eat with a lemon sauce.

Simple. Use the above recipe, omitting the eggs and using instead of graham flour and bread crumbs one and three fourths pints white flour.

To reheat puddings. All the preceding puddings are good reheated. Cut in slices, and warm in the oven, or fry in a little butter in a pan. Sift sugar over and eat with sauce.

PUDDING SAUCE.

One pint water made into a smooth starch with a heaping tablespoonful flour. Cook ten minutes, strain if necessary, sweeten to taste, and pour it on one tablespoonful butter and juice of a lemon or other flavoring. If lemon is not used, add one tablespoonful vinegar. This can be made richer by using more butter and sugar; stir them to a cream with a flavoring, then add the starch.

FRITTERS.

These are various doughs and batters fried in boiling fat, and eaten warm with sugar or a sweet sauce. The hot fat gives a puffy lightness and a delicious, crisp crust. Lard is most generally used, but cooking oil (see page 224) is better, and even fat prepared as (see same page) is good. The fat must be smoking hot to prevent its soaking into the dough. For the same reason batters so cooked must contain more egg than if they were to be baked.

Forms. The fritter may be rolled out and cut in shapes, or dropped in spoonfuls, or run through a funnel, being of course mixed of different consistency for each method. When nicely browned, take out with a wire spoon and lay on brown paper, which will absorb the fat, then sprinkle with sugar and send to table.

Soda raised fritters. Ingredients: One pint of flour (one half may be graham), one half teaspoonful salt, one teaspoonful oil, butter, or lard, one egg, and one half pint of sour milk with one half teaspoonful of soda, or same of sweet milk with one half teaspoonful soda and one teaspoonful cream of tartar. Beat the egg, white and yolk separately, adding the white last of all. Drop from a spoon into boiling lard, or omit nearly half the flour and pour through a funnel. This batter may be also raised with yeast.

Egg raised fritters. These are more crisp and delicate. If liked very light, soda or cream of tartar or baking powder may be added to these also. These batters are thinner than the preceding; they must be well beaten if no soda is used.

1. Ingredients: One scant pint of flour, two eggs, one teaspoonful salt, one half pint milk, one teaspoonful oil or butter. Beat the yolks well, then again well with the flour and milk, add the stiffly beaten whites last. Fry in spoonfuls.

2. Ingredients: One heaping pint of flour, four eggs, one tablespoonful oil or butter, one teaspoonful salt, about a pint of water, or enough to make the batter a little thicker than for pancakes. Proceed as before.

Additions. One tablespoonful of lemon juice may be added to any of the above recipes, or a little nutmeg or cinnamon if liked.

Fruit fritters. Take sour apples, peel, cut out the core neatly, and slice round in slices one fourth of an inch thick. Soak these a few hours in sweetened wine, lemon juice, or other flavoring. Dip in either of the above batters and fry. (They are also very good without being soaked in the flavoring.) Peaches, pineapples, and bananas may be used in the same way.

Bread fritters. Trim the crust from sliced bread, cut in nice shapes and soak soft, but not till they break, in a cup of milk to which has been added one beaten egg and some flavoring, as cinnamon, lemon, etc. Dip in fritter batter and fry.

COOKING OF VEGETABLES.

The legumes. As we have seen, the food value of the dried bean, pea, and lentil is great, but as usually cooked a large per cent of it is lost to us. In the process of cooking, the cellulose part must be broken up, softened, and as much as possible entirely removed. These vegetables, if they cannot be obtained ground, must be soaked in cold water some time before cooking, cooked till very soft, and then mashed and sieved. No form of cooking that does not include sieving can be recommended except for very hardy stomachs. See pages 252 and 277.

Potato. This vegetable must also be treated with care. The starch grains of which it is so largely composed swell in the process of cooking, and burst the cellulose walls confining them, but when this stage is reached the potato is too often

spoiled by being allowed to absorb steam and become sodden. As soon as tender, boiled potatoes should be drained, dried out a few moments, then sprinkled with salt, and the kettle covered close with a towel, until they are served. They should then be put into a napkin and sent to the table.

Other vegetables. Other garden vegetables are cooked more or less alike,— put into boiling water and kept at a rapid boil until tender, and no longer, — the length of time varying for any given vegetable according to the freshness, size, and degree of maturity. When done, or nearly so, they should be seasoned and served as soon as possible.

Mixed vegetables. A welcome variety in the serving of vegetables can be found in skillful mixture of two or more kinds. A few of these mixtures are green corn and shelled beans, or succotash, or green corn and tomatoes, green corn with stewed potatoes, potatoes and turnips mashed together, green peas with a quarter as many carrots cut very small, potatoes with same proportion of carrots and seasoned with fried sliced onions poured over.

Vegetables and fruits. There are also mixtures of vegetables and fruits that are very successful, as lentils or beans with a border of stewed prunes.

SOUPS WITHOUT MEAT.

In general: These soups should be largely used by the economical housewife; they are cheap and nutritious, and if carefully made and seasoned, excellent in taste. A large number of recipes are given, from which can be selected what is suited to materials on hand, to amount of time, and quantity of fire.

These will be arranged under vegetable soups, flour and bread soups, and cold soups.

VEGETABLE SOUPS.

If any meat bones are on hand or trimmings of meat not otherwise needed, simmer them from one to two hours in water and use the broth thus obtained instead of water in making any of

the following soups. Most important are those made from the dried bean, pea, and lentil, the three pod-covered vegetables. For their nutritive qualities see page 252.

Bean soup. Ingredients: One pound of beans, one onion, two tablespoonfuls beef fat, salt and pepper. Additions to be made according to taste: One fourth pound of pork, or a ham bone, a pinch of red pepper, or, an hour before serving, different vegetables, as carrots and turnips chopped and fried.

Soak the beans over night in two quarts of water. In the morning pour off, put on fresh water and cook with the onion and fat till very soft, then mash or press through a colander to remove the skins, and add enough water to make two quarts of somewhat thick soup. Season. This soup may also be made from cold baked beans. Boil one half hour, or till they fall to pieces, then strain and season.

Split or dried pea soup. Make like bean soup.

Lentil soup. Make like bean soup.

Green vegetable soups. The water in which vegetables have been cooked should never be thrown away, with the exception of that used for cooking beets, and potatoes boiled without peeling; even cabbage water can be made the basis of a good soup.

General method: Boil the vegetables until very tender, mash or press through a colander, thin sufficiently, and season.

Potato soup. Good and cheap.

Ingredients: Six large potatoes, peeled, one large onion, one heaping teaspoonful salt, one fourth teaspoonful pepper. For a richer soup add one fourth pound salt pork cut in bits (in this case use less salt) or add one cupful of milk or a beaten egg. Chopped celery leaves give a good flavor. Boil potatoes, onions and salt in a little water, and when very soft mash; then add, a little at a time and stirring to keep it smooth, a quart of hot water and one tablespoonful beef fat in which one tablespoonful flour has been cooked; or use the fat for frying bread dice, which add at the last minute.

Most cooks fry the sliced onion before putting it in the soup, but the difference in taste is so slight as not to be worth the few minutes extra time, if time is an object.

Green pea soup. This is a delicious soup and very nutritious. Large peas, a little too hard to be used as a vegetable, may be utilized in its manufacture.

Ingredients: One pint shelled peas, three pints water, one small onion, one tablespoonful butter or fat, one tablespoonful flour. Salt and pepper. Put peas and onion in boiling water and cook from one half hour to an hour, till very soft. Press through colander and season.

Pea and tomato soup. Add to above when done, one pint stewed tomatoes and a little more seasoning. This is an excellent soup, having the nutrition of the pea and the flavor of the tomato.

Tomato soup. Valuable for its fine flavor, and may be made nutritious by adding broth, milk, or eggs.

Ingredients: One pint tomatoes, two pints water, one tablespoonful fat, one tablespoonful flour, salt and pepper. Cook the flour in the fat, add the peeled tomatoes and a very little water. When they have cooked to pieces, mash them against the side of the pot, add the rest of the water and the seasoning.

Tomato soup No. 2. Proceed as above, using instead of half the water, one pint milk, into which one fourth teaspoonful soda has been stirred.

Parsnip soup. Ingredients: One pint of parsnips cut in pieces, three small potatoes, three pints water, or water and milk, salt, pepper, and butter. Cook till the vegetables fall to pieces, mash and add seasoning. If milk can be substituted for part of the water the soup will be improved.

Young vegetable or spring soup. Ingredients: One pint chopped onion, carrot, turnips, and celery root in about equal parts, one tablespoonful fat, one teaspoonful sugar, salt and pepper. Heat the fat, add sugar, salt, and pepper, then stir the vegetables in it till they begin to brown, add three pints of water and set back to simmer one to two hours. Serve without straining.

Green corn soup. Ingredients: One half dozen ears green corn, three pints water, one tablespoonful fat and one tablespoonful flour, salt and pepper, an egg, and a cup of milk. Cut the corn from the cob and boil one hour. Add the flour which has been fried in the fat, season and strain.

Dried corn soup. Make as above, using dried corn, soaked over night and boiled two hours.

Sorrel soup. An excellent flavor, new to most of us.

Ingredients: One pint sheep's sorrel, light measure (bought in city markets or gathered in fields), one onion, a few leaves of lettuce and parsley all chopped fine, one eighth teaspoonful nutmeg, one tablespoonful fat, two tablespoonfuls flour, three pints water, one or two eggs, one cup milk, salt and pepper. Heat the fat, add the chopped vegetables and sweat or steam for ten minutes, then add flour, and last the boiling water; add the milk just before serving. Serve fried bread with it.

"Hit and miss" soup. To illustrate how all bits can be used, here is a soup actually made from "leavings."

One cupful water drained from macaroni, one cupful water drained from cabbage with a few shreds of the cabbage, two small bones from roast veal, one scant tablespoonful boiled rice. Simmer these together with a chopped onion while the rest of the dinner is cooking, thicken with a little flour and serve with fried bread.

FLOUR AND BREAD SOUPS.

Flour soup. Ingredients: One tablespoonful beef fat, one heaping tablespoonful flour, two sliced onions, two pints water, one pint milk, one cupful of mashed potato, salt and pepper. Fry the onions in the fat until light brown; remove, pressing out the fat. In same fat now cook the flour till it is yellow, and add, a little at a time, the water. Put back the onions and let it stand awhile, then add milk and potato. Salt well. The potato may be omitted and a little more flour used.

Browned flour soup. Ingredients: One tablespoonful butter or fat, one half cupful flour, two pints water, one pint milk, one teaspoonful salt. Cook the flour brown in the fat over a slow fire or in the oven; add slowly the water and other ingredients. Serve with fried bread.

Browned farina soup. Make like above, but of wheat farina.

Bread soup. Ingredients: Dry bread, broken in bits, water, salt and pepper, an onion and a little fat. Soak the bread in boiling water for a few minutes, add the onion sliced and fried in the

fat; salt and pepper well. Or, use milk instead of water, and toasted or fried bread.

Noodle soup. (See page 259.)

MILK SOUPS OR PORRIDGES.

These are especially good in families where there are children, and would be welcome on almost any supper table. They are almost equally good eaten cold.

In making, use a porcelain kettle or an iron kettle, greasing it first with a little fat, as a scorched taste spoils the dish.

Wheat porridge (salted). Ingredients: Three pints milk, one pint of water (or half water and half milk), one third cupful flour, two eggs, two teaspoonfuls salt. To the boiling milk and water add the flour stirred smooth with a little cold milk; let it cook ten minutes. Beat the eggs in gradually, but do not cook them; serve with fried bread. Grated cheese is an addition to this soup.

Wheat porridge (sweet). Same as above, but using only a pinch of salt, and as flavoring three tablespoonfuls sugar and one fourth teaspoonful cinnamon. The flavor may be varied by using grated lemon peel, nutmeg, vanilla, bitter almond, or two fresh peach leaves boiled with the milk.

Of farina. These two porridges are still better made of farina instead of flour.

Barley porridge. Pearl barley is soaked over night in water, and then cooked for two hours till soft. During the last hour add milk instead of water as it dries away.
Flavor with salt and butter.

Indian meal porridge. Ingredients: One cupful meal, two quarts water, one tablespoonful flour, one pint milk, salt, and a little ginger (if liked). Boil the meal and water an hour; add flour and salt and boil one fourth hour, and add the milk just before serving.

Oatmeal porridge. Make in the same way, using oatmeal instead of flour.

Graham porridge. One cupful graham flour to three pints milk and water. Cook fifteen minutes. This may be varied in flavor like flour porridges.

These three porridges can be made from cold corn, oatmeal, or graham mush.

Chocolate soup. Ingredients: One fourth pound chocolate, two and one half quarts milk and water, sugar to taste, one egg yolk, a little vanilla or cinnamon. Cook the chocolate soft in a little water and add the rest; when boiling put in the other ingredients and cook the beaten white of an egg in spoonfuls on the top. Serve with fried bread.

Buttermilk soup or "Pop." The foreign kitchen has many recipes for this soup quite unknown among us. Cooking brings out the acid, but once used to that taste, one finds the soup good and wholesome.

Ingredients; To each pint of buttermilk, one tablespoonful flour and one tablespoonful butter, a little salt. Bring gradually to a boil, stirring constantly to prevent curdling, and pour on fried bread.

Varieties; Sugar and cinnamon are often added to this soup; also the yolk and beaten white of one egg. It is considered nutritious for the sick.

Another: The Germans often add to this soup small potatoes, and bits of fried bacon, in which case the butter is omitted. Or, to the buttermilk soup when done, is added half the quantity of cooked pears or prunes.

Brewis. To salted boiling milk, put enough bread crumbs (either white or graham) to make a thick, smooth porridge.

Sour cream soup. This soup is earnestly recommended for trial, as there are few ways in which such a delicious taste may be given to simple materials. Ingredients: Three pints water, one half cup sour cream, and the following mixture: One fourth cup milk, one half cup flour, one teaspoonful butter, one half tablespoonful salt, one teaspoonful sugar, one egg, one tablespoonful fluid yeast, or one fourth teaspoonful compressed yeast. Mix these together into a dough, and let it get light, then drop half of it in teaspoonfuls into the boiling water and cream; then thin the rest with water until it will pour, add it to the soup and cook five minutes. (Not all the dough may be needed.)

Cider soup. Ingredients: One pint cider just beginning to work, one pint water, one cup milk (boiling), one tablespoonful flour, a little cinnamon and sugar. Let cider and water come to a boil, add the flour rubbed smooth, and cook a few minutes; and lastly, add the milk. Serve with toast. An egg yolk may be added.

FRUIT SOUPS.

To be eaten warm or cold.

These are made of almost any well flavored fruit, cooked soft and mashed, sufficient water added, with a little thickening, sugar, and spice. They are especially welcome in summer; may be eaten as a first course, or set aside to be used as a drink during the meal.

Apple soup No. 1. Ingredients: Four cupfuls peeled and quartered apples cooked to a mush in a little water, one and one half pints water, one teaspoonful corn starch, three teaspoonfuls sugar, one fourth teaspoonful cinnamon, a pinch of salt.

No. 2. A soup plate full of apples, one cupful of rice. Cook soft and rub through a sieve, adding a little sugar, cinnamon, lemon peel, and an egg yolk. Thin sufficiently with water.

No. 3. Instead of rice, use in the above recipe bread with the addition of a few India currants.

No. 4. Instead of rice use oatmeal, and cook till soft, or use that already cooked.

Plum soup. Make like apple soup, but if the plums are very sour add a little soda, one fourth teaspoonful to a quart of soup.

Cherry soup. Made in the same manner.

These soups may also be made of dried plums, prunes, or dried sour cherries. Soak the fruit over night.

Soups of pears, etc. If soup is made of a milder fruit, as pears, which are at some seasons so cheap, add a few sour apples or more spice to give flavor.

ADDITIONS TO SOUPS.

If your soup has not strength enough, milk and eggs may be added if no meat stock is at hand.

How to add eggs. The egg should be beaten, mixed with a little of the soup, then added to the rest but not boiled. The yolk is better for this purpose than the white.

Meat extract. Liebig's meat extract is very valuable for adding flavor to a soup, but it is too expensive for general use.

1. Flour. This may be boiled a few minutes with the soup after being mixed smooth in a little water; or, better, cook it in a little butter or melted beef fat before adding to the soup.

2. Bread sponge. On baking day, save a little of the bread sponge, make thin enough to pour, and if you wish, add a beaten egg. Set away half an hour to raise again, and when light pour into the soup.

3. Farina. This preparation of wheat, now sold by the pound at a reasonable price, is most valuable as an addition to soup; it needs only to be sprinkled in and boiled for a few moments.

4. Potato. Mashed potato mixed smooth with a little milk, or grated cold potato, may be added to soup to give body.

5. Barley. Add to the soup one hour before it is done, pearl barley that has been soaked over night.

6. Rice. One half hour before serving, add to soup one tablespoonful of rice to a quart of soup.

7. Bread. Bits of bread dried hard in the oven, may be added to the soup just before serving, or fry them in the spider in a little beef fat, or soak in milk and eggs before frying. Or, toast bread and cut in squares.

8. Vegetables. Any small vegetables may be added, such as asparagus tops, tiny onions that have been first boiled in another pot, cooked peas, beans, etc. A favorite Russian soup is beef soup, with the addition of beets, cabbage, and carrots.

Most important of all additions to soup are those which need a little more time to prepare, but are worth the trouble if the soup is to be the principal part of the dinner. Such are the following:

DUMPLINGS FOR SOUPS AND STEWS.

This word has an unpleasant sound, too suggestive of the heavy and unwholesome balls often served under this name, but there seems to be no other name under which these different preparations can be classed. Their basis is bread and eggs, or flour and eggs. Bread mentioned here is hard dried bread; it must be softened by soaking in *cold* water (hot water makes it pasty), then press it dry in a cloth and crumble it.

Meat balls. Any cooked meat, or several different kinds when there is too little of each to be otherwise used, is chopped fine and mixed with as much bread, salted and peppered, a little chopped suet or butter, or better still, marrow, and a chopped onion and some herbs, and to each cup of this mixture allow an egg. Mix lightly, make out into little balls and cook in very gently boiling soup. Try one first to see if it holds together. If not, add a little flour.

Fish balls. Substitute for the meat any cooked fish, chopped fine.

Marrow balls. Two eggs to one cupful of bread and marrow size of an egg, chopped. Make as above.

Bacon balls. Instead of marrow, add cubes of bacon fried brown.

All these mixtures can also be fried in a pan as an omelet, or baked.

Flour and bread balls. Three cupfuls, half bread, half flour, one egg, butter size of an egg, one cupful milk and water, salt. Soak the bread in the milk and water, and make out into little balls with the other ingredients. Cook, covered, fifteen minutes (may also be boiled in salted water and eaten with fruit).

Egg sponge. One egg, one teaspoonful flour, a little salt. Beat white of egg to foam, mix lightly with the rest, and pour on top of the soup. Turn over in a few minutes with a skimmer, and before putting into the tureen cut it in pieces.

No. 2. One heaping tablespoonful flour to one egg and the yolk of another, and one teaspoonful butter. Beat hard and drop in with a teaspoon.

Schwaben Spetzel. One egg, three tablespoonfuls milk, nearly one half cupful of flour, salt. Pour through a tunnel into soup or into salted water, cook five minutes, and use to garnish beef.

Biscuit dough balls. An excellent addition to a stew or soup is of biscuit or rusk dough (see page 263), made into balls no larger than a chestnut, and cooked in the stew or steamed in a cloth above it.

Buttermilk balls. Also the following of buttermilk: One cupful buttermilk, one half teaspoonful soda, one egg, salt, and flour enough to allow of the batter being dropped in spoonfuls.

Macaroni. Cooked macaroni cut in pieces an inch long, is a pleasant addition to soup.

FLAVORS OR SEASONINGS.

Without doubt "hunger is the best sauce," but it is not true, as many think, that a craving for variety is the sign of a pampered and unnatural appetite; even animals, whom we cannot accuse of having "notions," have been known to starve in the experimenter's hands rather than eat a perfectly nutritious food of whose flavor they had wearied, and prisoners become so tired of a too oft repeated dish that they vomit at the sight and smell of it.

What we call flavors may or may not be associated with a real food. Meats are rich in flavors and each fruit has its peculiar taste; then there are the spices and aromatic herbs which are not parts of a real food, and it is most important that the cook should understand the art of adding these as seasonings to mild tasting foods, so as to make new dishes which shall be both nutritious and appetizing. The bulk of our nourishment must be made up of the flesh of a few animals, a half dozen grains, and as many garden vegetables, but the skillful cook can make of them, with the help of other flavors, an endless variety of dishes.

An American traveling on the continent of Europe becomes acquainted with many new dishes and tastes, and although not all of them are to his liking, he must conclude that our cookery, compared for instance with that of the French, is very monotonous. To be sure, we have the advantage of the European in

that our markets offer us a greater variety of natural foods, especially fruits, each having a flavor of its own, and this fact makes us somewhat more independent of the art of the cook; but still we have need for every lesson of this sort, and especially is this the case with the poor, who must keep to the cheapest food materials, which are not in themselves rich in flavor.

Spices and other flavors, when not used in excess, stimulate our digestive organs to appropriate more easily the food to which they are added; their agreeable odor starts the digestive juices, both in the mouth and in the stomach, and their flavor acting on the palate has the same effect.

The more common spices and flavors, as the housewife uses these terms, are salt, pepper, mustard, cinnamon and mace, nutmegs, cloves, ginger, caraway and coriander seeds, vanilla, and many volatile oils, such as those contained in the rind of lemons and oranges; and to this list we must add certain vegetables, as the horseradish and various members of the onion family, the caper and nasturtium seeds, and the aromatic herbs.

All these have their use and their abuse. Salt is hardly thought of in this list, so necessary do we consider it, and its use is well enough governed by our palate, though no doubt we over rather than undersalt our foods. Pepper is also in nearly every household used to excess, being added to too many dishes. The pungent mustard should be still more carefully used, but a little of it adds relish to a salad or a meat sauce and goes especially well with vegetables, as beans. Cinnamon, mace, and nutmeg we use principally with sweet dishes, but nutmeg makes a nice variety in certain meat stews and in croquettes; foreign cooks use it far too much to suit our taste. Almost the only use of the caraway and coriander seeds is in cookies; try the former in a potato soup for variety. Ginger seems to go well with Indian meal in a pudding or porridge, and with molasses wherever used.

To give the uses for onions and for the aromatic herbs would be too long a task. The latter can all be bought in a dried state very cheaply and they retain their flavor well; one of the most useful however, parsley, is much better fresh; by all means keep a little box of it growing in a window. Perhaps after onion, celery is most useful as a flavor for soups and stews, root, stem, leaves, and seed being all valuable.

In the flavoring of soups and stews, it is well to use a number of flavors, letting no one of them be prominent above the others; on the other hand, it is well to have certain favorite dishes seasoned always the same way, as fresh pork with sage, summer savory in a bread dressing, etc.

DRINKS AT MEALS.

A warm drink at meals is better than a cold one, especially in winter or at any time when we are tired; and the drinking of ice water cannot be too strongly condemned, lowering as it does the temperature of the stomach and so delaying digestion. To furnish warm drinks for each meal acceptable to the palate, cheap and harmless, is no easy question. Soups or broth once adopted as a part of two meals in the day, as is so frequently seen in Europe, and the problem is half solved; indeed, some of the drinks here given are really thin vegetable soups or porridges to which the flavor of salt or of sugar may be given according to taste.

Coffee. It may be concluded, after comparing authors on the subject, that although coffee somewhat retards digestion and acts as a stimulant to the nervous system, still one or even two cups of moderately strong coffee a day will not harm a healthy person. We may say, therefore, that its use to this extent is a question of expense only. Java and Mocha coffee in equal parts are considered the best mixture. Rio is much cheaper and of strong pure flavor. The amount to be used for moderately strong coffee is one tablespoonful (ground) to a cup.

Chiccory is considered here only as an adulterant, whereas in Europe a very little of it, say one half teaspoonful of the prepared chiccory to a cup of ground coffee is used to improve the flavor.

Next to the quality of the coffee, it is of importance that it should be freshly ground and browned. If you buy it browned, reheat it first before grinding. The easiest and most economical way of making is to grind it very fine and put into a bag made of woven stuff, a white stocking top will do; leave room to swell. Heat this in your coffee pot as hot as you can without burning.

Pour on boiling water and keep it hot and close-covered for fifteen or twenty minutes. Boiling coffee increases its strength but does not improve its flavor.

Tea. All authors agree as to the harmfulness of strong tea taken to excess. Take great pains in making tea. Use an earthen teapot, and have a tea-cozy or a large flannel cloth to wrap it in. The water used should be between hard and soft, extracting the aroma but not the astringency; in China river water is used. If hard water must be used, remember that boiling increases its hardness and that it should be used as soon as it reaches the boiling point.

Take one teaspoonful of tea to a cup, put it in the teapot and heat in an oven till hot, pour on one cup of water that has just come to a boil, and cover with the tea-cozy. Let it stand five minutes, then fill up with the requisite quantity of hot water and serve immediately.

Cocoa and chocolate. These both contain a good deal of nourishment, and as drinks are considered rather heavy. As the various kinds differ very much from each other, they are best prepared according to the recipes found on the packages.

"Cambric tea." Milk, except for children, can hardly be looked upon as a drink, but diluted with hot water and sweetened, it has already been christened for the children as "cambric tea," and it is no bad drink for their elders.

Gruels. A very thin gruel, slightly sweetened, is a good drink.

Oatmeal gruel. Into a quart of boiling water stir two tablespoonfuls of oatmeal; boil for an hour or longer, strain through a coarse sieve or colander, add a pinch of salt, and a little milk and sugar.

Rice gruel. Wet one tablespoonful rice flour in a little cold milk, put into one quart of boiling water, salt slightly, and boil till transparent. Flavor with a little lemon peel and sugar.

Cornmeal gruel. One quart boiling water, three tablespoonfuls corn meal washed in several waters, one half teaspoonful salt; add one half cupful milk and a little sugar; a pinch of ginger is an improvement.

Barley gruel. Soak pearl or ground barley all night or a few hours in cold water, put into boiling water and cook till very soft. Season like the others.

Sago and tapioca gruel. Can be made in the same way.

All these drinks must be thin and not too highly seasoned.

Corn coffee. Brown common field corn as you would coffee, as brown as you can without burning. Grind coarsely and steep like coffee. Add milk and sugar and you will find it a delicious drink.

Cold drinks in summer. Lemonade is too strongly acid for a regular drink at meals, but lemon as a flavor is always welcome.

Irish moss lemonade. Wash a handful of Irish moss in five waters, pour over it two quarts boiling water and let it stand till cold. Strain, adding more water if necessary, and add the juice of two lemons and sweeten with lump sugar which you have rubbed on the lemons to obtain the oil in the skin.

Soda cream. One pound sugar, one ounce tartaric acid dissolved in a pint of hot water. When cold flavor with lemon zest or extract, and add the beaten white of an egg. When used, add two tablespoonfuls of it to a glass of water in which you have dissolved one fourth teaspoonful soda.

Apple water. Slice juicy sour apples into boiling water and keep warm an hour. Strain and sweeten. All these drinks taste best cooled (but not *too* cold) with ice.

Cider. Sweet cider can be bottled for use and makes a delicious drink. Boil and skim till it is clear — no longer; pour hot into bottles, and seal.

See also vegetable and fruit soups.

COOKERY FOR THE SICK.

It is comparatively easy for your family to live on a small income while all its members are in good health, but you will find your resources all too slender when you must cater for the appetite of an invalid.

At best, sickness is always a severe drain on the limited income, but here, as in every other department of your work, you will

find that good sense and ingenuity will often stand you in stead for money. During a severe illness the food as much as the medicine is under the care of the physician, but when the danger is over and he has left you with only general directions, you will be more than likely in your bewilderment to take the advice of the first neighbor that drops in, although you may know that neither her advice nor experience is as good as your own.

Now consider first, what did the doctor mean by saying that the patient must be "built up," and how is the wasted frame to get back the fat and muscle that were burned away in the sickness? Chiefly, as you know, by the digestion of food, the proteids and fats and carbohydrates that we have been talking about, and still another, a real food although so often forgotten, the oxygen of the air.

We have said that we need not concern ourselves about this food, that it would take care of itself; and so it will when we are in a state of health and living as human beings should, for as we walk or work we are fed by the air without knowing it. But the case is quite different with a poor invalid shut up in a sickroom; we must bring the fresh air to him with as much care and regularity as we do his jellies and broths.

When we are considering what we shall feed our invalid, we cannot do better than keep to our old classification of proteids, fats, and carbohydrates. He must have all these principles, but in the most digestible form, for the stomach is feeble like the rest of the body. For this reason the proteids must be furnished mainly from the animal kingdom, butter and cream must supply the fat, and the carbohydrates must bring with them as little as possible of the tough cellulose, and they must be so cooked as to be easily digested.

First, as to the proteids.

Hot milk, given often in small quantities, is much used in the early stages of recovery and is generally better liked if accompanied by a bit of toasted bread or made into a thin gruel.

In the first rank, also, comes soup made of lean beef scraped fine, covered with cold water and allowed to stand for an hour, then brought slowly to scalding heat and kept there for a short time; it is then strained through a coarse sieve, the small, brown flakes being allowed to pass. Season only with salt. Or, broil

a thick tender steak, cut it in pieces, and then with a lemon squeezer press out every particle of juice it may then be diluted and seasoned.

Mutton broth is made like beef soup but should be cooked a longer time. Chicken broth also requires more cooking. Any of these soups may have a little rice or tapioca cooked with them.

Eggs are an important item in the diet of an invalid, being very nutritious and, if fresh, easily digested; do not use them if at all uncertain of their age.

Eggs may be given raw (see page 236), or soft-boiled (see page 236), or poached in hot water. An egg may be served in many ways and makes always a pretty and attractive dish. In cooking it should never be submitted to a high temperature, as that makes the white part horny and indigestible.

A custard made from an egg and a cup of milk and half a tablespoonful of sugar may be given early in a convalescence. Or use beef soup or chicken broth instead of the milk, and flavor with a little salt and pepper. These custards should be made in a pail set in a kettle of boiling water, the custard being stirred till it begins to thicken.

Next in order comes cooked meat. Beef is best of all, but let it be juicy and tender and broil or roast it, serving it rare. Probably a broiled mutton chop ranks next, although chicken, because of its delicate flavor, will often receive the first choice. An invalid should not touch pork, and should be given veal or lamb only in the form of soup.

As to fats, the system needs them of course, but fat meat should not be given, only butter or, better still, cream. The butter must never be melted and soaked into the food, nor made into a sauce.

As to the vegetable part of the diet, much care must be used. In the form of gruel or porridge, it is generally very welcome and gives the fluid part of the meal in a good form. For Indian meal and oatmeal porridge see page 280. Milk may take the place of the water.

Toast is with good reason considered invalids' food, for the process of toasting turns part of the starch of the bread into dextrine which is digested with great ease. Grains may be also

browned or roasted. Roast rice as you would coffee, cook as usual and eat with a little cream. Remember that bread for toast must be cut thin and first dried out at a little distance from the fire, then brought nearer and browned. You may then serve it as dry toast lightly buttered, or in addition to the butter and a little salt, pour hot water or milk on it just before serving.

Panada of toasted brown bread, white bread, or crackers is made by piling the pieces in a bowl, having sprinkled either salt or sugar over, and then pouring over enough boiling water to soak them well. It should be kept hot for an hour or more, the pieces then lifted out carefully on a hot saucer and served with a little cream and perhaps more salt or sugar. Nutmeg may be added.

Rice is also a very valuable food for use in sickness, as it does not tax the most delicate digestion.

Macaroni is easily digested and of high food value. It should be boiled in salted water till tender and served with a little butter or cream. Or it may be added to a custard and lightly baked.

Barley, thoroughly cooked, is good food for an invalid. Oatmeal must be used with caution until the digestion becomes stronger.

As to vegetables proper, a mealy baked potato is perhaps the first to be introduced into the bill of fare; remove the inside, mash fine and season with a little salt and cream. Beware of potatoes cooked in any other way.

The juice of fruits may be used early as a flavor in drinks, but the pulp must be discarded. A baked apple is safest to begin with, when the time comes to introduce fruit as such into the diet.

As to the serving, use the best china, silver, and linen that you have in the house, and let exquisite neatness never fail.

Remember that surprises are delightful to a sick person; never let the bill of fare be known beforehand, and if you can disguise a well known dish, so much the better. Beaten white of egg is a good fairy, and serves you cheaply. Snowy white or made golden brown in the oven, it may top many a dish, concealing at one time a custard, at another a mold of chicken jelly, or even a cup of delicate apple sauce.

The processes of cooking, if simple, an invalid loves to watch, and the sight is often a whet to the appetite. Bring his gruel to him in the form of mush and thin it before his eyes with milk or cream, coddle his egg in a stoneware bowl while he eats another course, and by all means make his tea at his bedside.

BILLS OF FARE.

The following bills of fare are made out for a family of six persons, consisting of a working man, two women, and three children between the ages of six and fifteen, the size of the family and the ages attained being considered sufficiently near the average. The amount of food and the proportions in which the great food principles are represented approximate to what is demanded by standard dietaries for such a family. For the man of the family we have taken, as has been said, the one proposed by Prof. Atwater for an American at average manual labor, for the women and children those proposed by Prof. König.

Dietary adopted. The amounts represented by them are:

	Proteids.	Fats.	Carbohydrates.
Man	125 gms.	125 gms.	400 gms.
Two women (each)	96 "	48 "	400 "
Three children, 6 to 15 years (each)	76 "	44 "	320 "
Total	545 gms.	353 gms.	2,210 gms.
Or, translated into ounces	19.19 oz.	12.42 oz.	78.03 oz.

In calculating these amounts we have followed almost entirely the analytical tables compiled by Prof. König.

Meat is reckoned without bone and moderately fat, and in nearly all the bills of fare the amount of proteids enough exceeds that required by the dietary adopted so that we can afford this loss. Flour is of medium quality, eggs are reckoned without shell, and milk as weighing 34.4 ounces per quart.

As to prices, they are mainly those of Baltimore markets, corrected in some cases by those of New York. Eggs are reckoned as costing in the spring eighteen cents, in fall and winter twenty-five cents; canned fruit is put down at the price paid for the

fruit in summer. The cost of raw material is given in all cases, bread being reckoned at the cost of the flour contained in it.

In three different seasons, four days in succession are selected, these days being the ones considered most trying to the housekeeper — Saturday, Sunday, Monday, and Tuesday — and this gives an opportunity to show how the food should be planned and cooked ahead. It is intended that on Saturday the food for Sunday should be cooked as nearly as possible, as the Sunday dinner should be a good one, but requiring a minimum of labor on that day; the dinner on Monday should be such as can be cooked on the back of the stove and in the oven.

The recipes will have to be varied a little according to advice given in appropriate places as to economy, *e. g.*, substituting beef fat for butter, or adding it when skimmed milk is used instead of whole milk.

It is intended that each day there shall be a small surplus of money for purchasing seasonings and flavors.

INTRODUCTION TO BILLS OF FARE, CLASS I.

(*To the Mother of the Family.*)

In the general introduction the writer has stated a few principles that should guide us in choosing our food. We have learned that to keep us in good health and working order we ought to have a certain amount of what is best furnished by meat, eggs, milk, and other animal products, and that we must also have fats as well as what is given us in grains and vegetables.

But now our work has only just begun, for we are to furnish these food principles in the shape of cooked dishes to be put on the family table three times a day, and the dishes must not only be nourishing but they must taste good, and there must be plenty of variety from day to day; and last — and this is the hardest point of all — we are to try to do this for the sum of *thirteen cents per person daily*.

I am going to consider myself as talking to the mother of a family who has six mouths to feed, and no more money than this to do it with. Perhaps this woman has never kept accurate accounts, and does not know whether she spends more or less than this sum. She very likely has her "flush" days and her

"poor" days, according to the varying amounts of the family earnings, and it may be a comfort to her to know that if she could average these days and plan a little better, she could feed her family nicely on this sum.

A few facts as to what the writer knows to have been done in this line will not be amiss. I knew a family of six belonging to one of the professional classes, half grown people, and half children, that lived for a year on an average of eleven cents per person daily, and no one would have said that they did not live well enough. They had meat about four days out of the seven, there was always cake on their supper table, and they used plenty of fruit.

Here is an average bill of fare: Breakfast — milk toast, fried potatoes, coffee; dinner — soup made of shank of beef, fried liver, rice, and potatoes; supper — bread and butter, fried mush, stewed pears, and cake. Next day there was pressed beef made from the soup meat chopped and flavored, and next day there was cheap fish nicely fried. The head of this household was a skillful economist, absolutely no mistakes were made in cooking, and not a scrap was wasted. She had a long list of simple dishes at her command, and she especially studied variety. "I abandon even a favorite dish for weeks," she said, "if any one tires of it." I give this as a sample of what I know to have been done by a highly respectable family in a city of small size in one of our Eastern States.

It must be mentioned that the price on which this family lived in comfort could not have been as low as it was but for one great help; they had a small garden that furnished green vegetables and a little fruit. But then, almost every family has some special advantage that would lower the rate somewhat; one buys butter or fruit advantageously of friends in the country, another can buy at wholesale when certain staples are cheapest, still another may be able to keep a few fowls, and so on. Numerous instances could be brought to prove that the food for a family can be purchased in a raw condition for the sum per head for which we have undertaken to buy it, and that by skill in cooking, flavoring, and giving right variety, a healthful and very acceptable diet can be furnished, though it cannot, of course, contain luxuries.

Another thing, when I speak of a woman who is to buy the food of a family for 13 cents apiece daily, I have in mind the wife of a man who earns this sum himself, the wife having her time to attend to the housework and children. If a woman helps earn, as in a factory, doing most of her housework after she comes home at night, she must certainly have more money than in the first case in order to accomplish the same result, for she must buy her bread already baked and can only cook those dishes that take the least time.

I shall take for granted that you have the kitchen utensils already described; if not, buy them, because you cannot afford to do without them. Food is very expensive compared with pots and pans; you must not spoil food for lack of the right things to cook it in.

I only ask you in advance to try the recipes I shall give and to try to lay aside your prejudices against dishes to which you are not accustomed, as soups and cheese dishes for instance. You cannot afford to reject anything that will vary your diet, for many good tasting things you cannot buy.

I know it is hard for a busy woman to give to her cooking a bit more time than will "just do," but if you make it a rule to determine the night beforehand just what you will cook on the following day, no matter how simple the food may be, you will gain this result: with the materials at your disposal you will put before your family much better food, and they will call you a good cook and think that no family need live better than they; and this impression will be made principally from your having the right variety. Let us understand to begin with that it is your business just now to conquer this food question as it affects your family. Just as the business man must watch the market and take advantage of a half cent a pound on an article, that he may successfully compete with his neighbor, so you must be on the alert to use every possible advantage. It is a struggle in which energy and calculation will tell for a great deal, and you will have solid enjoyment in every point that you gain.

In buying meat, your saving cannot be so much in quantity as in quality. Try to learn the different parts of an animal, and to distinguish between the meat from a fat ox and that from a lean one, for, as we have explained, the former has less water in it,

and why should you pay good money for that which nature gives you free? In winter try to buy meat ahead, so that you can make it tender by keeping it, and you will notice, too, that the larger the piece you buy the smaller is the per cent of bone you get with it. The amount of bone in the whole animal, as in the case of an ox, is not more than ten or eleven per cent, but the buyer of a small piece of meat often gets twice that proportion. As we have said again and again in these pages, the low-priced or tougher parts have as much nutriment for you as the rib roast which is beyond your purse. Choose often the fat middle rib and cook it long and slowly; buy the neck and scrag of mutton and make a stew with vegetables; buy half a calf's head and see what a fine soup you can make of it. Have beef's liver now and then and tripe, rather than put your money into sausage of doubtful quality. By all means buy fish when it is cheap, catfish for instance, which are excellent fried. Keep suet always on hand and use instead of butter, as has been directed.

No one need tell you how valuable salt pork and bacon are for you, — the only danger is that you will use too much of them.

In buying eggs you must be governed by the price; in winter use as few as possible, and even in the spring when they are cheapest, remember that they are not as cheap as the lowest-priced cuts of meat from fat animals. But when they cost only fifteen cents a dozen you can well disregard any small comparison of nutritive values, in consideration of their high worth in furnishing variety; you can afford to use them now and then in the place of meat and in making the various egg dishes.

Of the value of cheese as a regular dish to take the place of meat, you can read in another part of this essay. Buy it once a week at least, the skim variety if you cannot afford the others, and grate or cook it according to the recipes given.

Try to find a reliable milkman and buy skimmed milk at half the price for full, and use it for all cooking purposes, keeping full milk, and if possible a little of the cream, for coffee.

Now let us take the vegetable part of your diet.

Grains. You must keep on hand every kind of flour and grain that is not too expensive; be thankful that wheat flour is so good and so cheap, it will be your best friend. If you are not already skillful in using it in bread and other doughs, you

will waste your materials and make mistakes at first, but there is nothing for you but to become mistress of this department of cookery. Use bread freely in all the bread dishes, learn how to make every one. You will use buckwheat for cakes, rice for puddings, barley in soups, oatmeal and cornmeal for mushes, and you must learn to use them all in as many ways as possible. The grains are cheaper foods for us than vegetables, although dried peas, beans, and lentils follow hard upon them. Even the potato, which may be called our favorite vegetable, is more expensive than wheat flour, if we are talking only of food values.

Except in the height of their season, have nothing to do with green vegetables, at least not under the impression that they are cheap; if you buy them, know that you are paying for flavors and variety rather than for food. But even in the early spring, buy plenty of such vegetables as onions, carrots, parsley, and other green herbs for your soups and stews. When you go for a walk in the country, be sure to bring home mint and sorrel in your pocket; the former will make you a nice meat sauce, the latter a delightful flavor in soup. It will be perfectly easy for you to grow in a window box that delicious herb, parsley, and have it always fresh.

For a low purse there is no help so great as a knowledge of flavorings. When we remember that we can live on bread, beans, peas, and a little cheap meat and fat the year round, if we can only make it "go down," we shall realize the importance of such additions as rouse the appetite; there is room here for all your skill and all your invention. Always make a cheap but nutritious dish inviting in appearance; especially does this influence the appetites of children, who are delighted with a very plain cake if only a few raisins or some sugar appear on the top.

The bills of fare on pages 299 to 305, where 78 cents covers the cost of food per day for a family of six, and where the amount of food is carefully weighed and estimated, is meant only to suggest to you how in a few cases your food problem can be solved. You can, no doubt, spend the money in ways that will better suit the tastes of your family, but I beg you to examine anew your favorite dishes to see if they are as nutritious as they should be for their price. Remember that the proteid column is the one that you must look to most carefully because it is furnished at the

most expense, and it is very important that it should not fall below the figures I have given. If, for instance, you should economize in meat in order to buy cake and pastry, this column would suffer at the expense of the other two, and your family would be under-nourished.

BILLS OF FARE. — CLASS I.

For family of six, average price 78 cents per day, or 13 cents per person.

SATURDAY, MAY.

Breakfast — Flour pancakes (p. 267) with sugar syrup, coffee.

Dinner — Bread soup (p. 279), beef-neck stew, noodles (p. 258), swelled rice pudding (p. 270).

Supper — Browned flour soup with fried bread (p. 279), toast and cheese (p. 239, No. 1).

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
1-2 pound rice	.64	.08	6.12	4
1 pound sugar	....	....	15.42	7
3-4 pound fat cheese	3.00	3.48	.24	11 1-4
2 quarts skimmed milk	2.12	.48	3.30	8
2 pounds flour	3.84	.48	22.88	6
1-2 quart whole milk	.58	.62	.83	3 1-2
2 eggs	.34	.32	....	3
2 1-2 pounds beef neck	8.40	2.20	....	20
3-8 pound suet	....	5.88	....	3
1-8 pound coffee	....	....	....	3 2-5
3 1-2 pounds bread	3.36	.28	29.06	8 1-20
Total	22.28	13.82	77.85	77 1-5
Required	19.19	12.42	78.03	78

SUNDAY, MAY.

Breakfast — Milk Toast, coffee.

Dinner — Stuffed beef's heart (p. 229), potatoes stewed with milk, dried apple pie (p. 270), bread and cheese, corn coffee (p. 289).

Supper — Noodle soup, from Saturday, (p. 259), broiled herring, bread, tea.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
Heart of fat ox, weighing 2 pounds	5.76	2.56	....	10
4 pounds bread	3.84	.32	33.22	9 1-5
3-4 pound sugar	....	....	11.88	5
1 quart skimmed milk	1.06	.24	1.65	4

1-2 pound dried apples	.10	....	4.50	6
1 1-2 pounds flour	2.88	.36	17.16	4 1-2
12 smoked herring (1 pound)	3.36	1.36	....	10
1-4 pound suet	....	9.23	....	2
2 pounds potatoes	.64	....	6.62	2 1-2
1-4 pound butter	....	3.33	....	6 1-4
1-2 pound skimmed cheese	2.40	1.07	.40	4
Tea	...	....	....	2
1-8 pound coffee	....	....	....	3 2-5
1 quart whole milk	1.16	1.23	1.65	7
Total	21.20	14.39	77.08	76
Required	19.19	12.42	78.03	78

MONDAY, MAY.

Breakfast — Oatmeal mush with milk and sugar, bread, coffee.
Dinner — Pea soup (p. 277), mutton stew (p. 231), boiled potatoes, bread.
Supper — Bread pancakes (p. 259), fried bacon, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
2 eggs	.34	.32	....	3
3-4 pounds oatmeal	1.74	.72	7.80	3 3-4
1-8 pound coffee	....	....	....	3 2-5
1-2 pound sugar	....	....	7.92	3 1-2
1 1-2 quarts skimmed milk	1.59	.36	1.48	6
3-4 pound bacon	.36	9.60	....	9
4 pounds potatoes	1.28	....	13.24	5
4 pounds bread	3.84	.32	33.20	9 1-5
1 quart whole milk	1.16	1.24	1.66	7
3 pounds shoulder of mutton	8.16	2.88	....	21
1 pound peas, dried	3.68	.32	8.32	5
1-2 pound flour	.96	.12	5.72	1 1-2
Total	23.11	15.88	80.34	77 3-10
Required	19.19	12.42	78.03	78.

TUESDAY, MAY.

Breakfast — Oatmeal mush and milk, buttered toast, coffee.
Dinner — Fried catfish with mint sauce (p. 247), fried potatoes, bread.
Supper — Fried farina pudding (p. 270), broiled salt pork, bread, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
1 pound oatmeal	2.32	.96	10.40	5
1 quart whole milk	1.16	1.23	1.65	7
1 quart skimmed milk	1.06	.24	1.65	4
3 1-2 pounds catfish	7.00	.20	....	17 1-2
1 1-2 pounds farina	2.50	....	18.22	7 1-2
2 eggs	.34	.32	....	3
4 1-2 pounds bread	4.32	.36	37.36	10 35-100
Coffee	....	....	....	3 2-5
2 pounds potatoes	.64	....	6.62	2 1-2

5-8 pound salt pork	.30	8.00	....	7 1-2
1-8 pound butter	....	1.67	....	3 1-8
1-4 pound sugar	....	....	3.96	1 3-4
Tea	....	....	....	2
Total	19.64	12.98	79.86	74 3-5
Required	19.19	12.42	78.03	78

SATURDAY, SEPTEMBER.

Breakfast — Soda biscuit, baked potatoes with drawn butter sauce, cocoa.

Dinner — Pea soup (p. 277), Irish stew, bread.

Supper — Corn mush and molasses, bread and grated cheese, tea.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
1 pound dried peas	3.68	.32	8.32	5
2 pounds scrag of mutton	5.44	1.92	....	16
3 pounds potatoes	.96	....	9.94	3 3-4
3 pounds bread	2.88	.24	24.90	6 9-10
2 pounds cornmeal	3.14	.90	19.50	6
1-4 pound sugar	....	....	3.96	1 3-4
1-4 pound fat cheese	1.00	1.56	.08	3 3-4
1 quart whole milk	1.16	1.23	1.65	7
1-4 pound butter	....	3.33	....	63-20
1 1-2 pounds flour	2.88	.36	17.16	6 3-4
1-4 pound suet	....	3.92	...	2
1-4 pound molasses	....	....	2.48	2 1-2
Cocoa shells	....	....	....	2
Tea	....	....	....	2
Total	21.14	13.78	87.99	71 1-2
Required	19.19	12.42	78.03	78

SUNDAY, SEPTEMBER.

Breakfast — Oatmeal and milk, bread and butter, cocoa.

Dinner — Broiled beef's liver, boiled potatoes and carrots with fried onions (p. 276), bread and cheese.

Supper — Lentil soup with fried bread (p. 277), smoked herring, bread, barley porridge (p. 280).

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
1 1-2 pounds beef's liver	4.80	.96	....	15
3 pounds potatoes	.96	....	9.94	3 3-4
1 pound carrots	....	....	1.44	1 1-2
1 1-2 pounds oatmeal	3.48	1.44	15.60	7 1-2
1-2 pound lentils	2.04	.16	4.32	5
1 1-2 quarts whole milk	1.74	1.85	2.48	10 1-2
1-2 pound sugar	....	....	7.92	3 1-2
1-4 pound pearl barley	.44	.06	2.86	2
1-4 pound suet	....	3.92	....	2
4 pounds bread	3.84	.32	33.20	9 1-5
6 smoked herring (8 ounces)	1.68	.68	....	5

1-4 pound butter	....	3.33	....	6 1-4
1-4 pound fat cheese	1.00	1.16	....	3 3-4
Cocoa shells	....	....	....	2
Total	19.98	13.88	77.76	76 9-10
Required	19.19	12.42	78.03	78

MONDAY, SEPTEMBER.

Breakfast — Buckwheat cakes, fried bacon, coffee.

Dinner — Giblet soup (p. 236), baked potatoes with drawn butter sauce, bread.

Supper — Codfish balls (p. 235), cheese, bread, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
2 pounds buckwheat flour	3.04	.64	23.30	10
Giblets	2.20	.12	....	8
3 pounds potatoes	.96	....	9.94	3 3-4
3-4 pound bacon	.36	9.60	....	9
4 1-2 pounds bread	4.32	.36	37.36	10 35-100
1-2 pound sugar	....	....	7.92	3 1-2
3-4 pound fat cheese	3.00	2.48	.24	11 1-4
1 pound salt codfish	4.80	.16	....	8
Tea	....	....	....	2
1 quart whole milk	1.16	1.23	1.65	7
1-8 pound coffee	....	....	....	3 2-5
Total	19.84	15.59	80.41	76 1-4
Required	19.19	12.42	78.03	78

TUESDAY, SEPTEMBER.

Breakfast — Fried bacon, boiled potatoes, bread, coffee.

Dinner — Boiled corned beef with horseradish sauce, stewed cabbage, bread, barley porridge (p. 280).

Supper — Pea soup, yeast biscuit and butter, stewed fruit.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
1 1-2 pounds corned beef	6.96	1.54	....	15
3 pounds cabbage	.80	....	2.00	6
2 pounds flour	3.84	.48	22.88	6
2 pounds potatoes	.64	....	6.62	2 1-2
1 pound dried peas	3.68	.32	8.32	5
3 1-2 pounds bread	3.36	.28	29.06	8 1-20
1-2 pound bacon	.24	6.40	....	6
1-4 pound butter	....	3.33	....	6 1-4
1-8 pound suet	....	1.96	....	1
1-2 pound pearl barley	.88	.12	5.72	4
1 quart skimmed milk	1.06	.24	1.65	4
1 pint whole milk	.58	.62	.83	3 1-2
1-8 pound coffee	....	....	....	3 4-10

1-2 pound sugar	....	....	7.92	3 1-2
Fruit	....	....	....	3
Total	22.04	15.29	85.00	77 1-5
Required	19.19	12.42	78.03	78

SATURDAY, JANUARY.

Breakfast — Fried bacon, corn bread (p. 262), coffee.

Dinner — Browned flour soup (p. 279), stewed mutton, mashed potatoes, bread.

Supper — Baked beans, bread, apple dumplings (p. 271) with pudding sauce (p. 274), tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
3 pounds neck of mutton	8.16	2.88	....	24
3 pounds potatoes	.98	....	9.94	3 3-4
4 pounds bread	3.84	.32	33.20	9 1-5
1 pound flour	1.92	.24	11.44	3
2 pounds corn meal	3.14	1.20	22.40	6
1 pound beans	3.68	.32	8.56	5
1-2 pound sugar	....	....	7.92	3 1-2
1-2 pound bacon	.24	6.44	....	6
1-8 pound suet	....	1.96	....	1
1-8 pound coffee	....	....	....	3 2-5
1 quart whole milk	1.16	1.23	1.65	7
Apples	....	....	....	2
Tea	....	....	....	2
Total	23.10	14.59	95.11	75 4-5
Required	19.19	12.42	78.03	78

SUNDAY, JANUARY.

Breakfast — Fried codfish, bread and butter, coffee.

Dinner — Sheep's head stew with soda biscuit dumplings, baked potatoes, bread and grated cheese, cocoa.

Supper — Potato and onion salad, broiled salt pork, bread, corn mush with pudding sauce (p. 274).

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
2 pounds corn meal	3.14	1.20	22.40	6
1 quart skimmed milk	1.06	.24	1.65	4
1 pint whole milk	.58	.62	.83	3 1-2
1-2 pound sugar	....	....	7.92	3 1-2
3 pounds bread	2.88	.24	24.90	6 9-10
1 pound salt codfish	4.80	....	....	8
1-2 pound butter	....	6.66	....	12 1-2
1-4 pound skim cheese	1.20	.53	.20	2
4 pounds potatoes	1.28	....	13.25	5
1-4 pound salt pork	.12	3.20	....	3
1-4 pound suet	....	3.92	....	2

3-4 pound flour	1.44	.18	8.58	2 1-4
1 sheep's head, assumed to contain 1 1-2 pounds meat	4.08	1.44	....	12
Onions	....	....	....	2
Cocoa shells	....	....	....	2
Coffee	....	....	....	3 2-5
Total	20.58	18.23	79.73	78
Required	19.19	12.42	78.03	78

MONDAY, JANUARY.

Breakfast — Fried mush and molasses, bread, coffee.

Dinner — Soup (from boiled beef) with macaroni, boiled beef flank with mustard sauce, bean puree, bread.

Supper — Boiled potatoes with butter gravy, dried apple roly-poly pudding (p. 271), bread, tea.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
2 pounds beef flank	6.72	1.76	....	16
1 pound beans	3.68	.32	8.56	5
1-2 pound dried apples	.10	....	4.50	6
2 pounds potatoes	.64	....	6.62	2 1-2
2 pounds corn meal	3.14	1.20	22.40	6
1 1-2 pounds flour	2.88	.36	17.16	4 1-2
1-4 pound butter	....	3.33	....	6 1-4
1-4 pound suet	....	3.92	....	2
1-4 pound molasses	....	....	2.48	2 1-2
1-2 pound sugar	....	....	7.92	3 1-2
3 pounds bread	2.88	.24	24.90	6 9-10
1 quart whole milk	1.16	1.23	1.65	7
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
1-4 pound macaroni	.36	.02	3.06	3 3-4
Total	21.56	12.38	99.25	77 3-10
Required	19.19	12.42	78.03	78

TUESDAY, JANUARY.

Breakfast — Fried potatoes, bread, coffee.

Dinner — Browned farina soup with toast (p. 279), stewed mutton with yeast dumplings.

Supper — Bean soup, milk toast, tea.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
2 1-2 pounds mutton	6.80	2.40	....	20
1 quart skimmed milk	1.06	.24	1.65	4
1 1-2 pounds beans	5.52	.48	12.84	7 1-2
1-4 pound butter	....	3.33	....	6 1-4
1-2 pound suet	....	7.84	....	4
1-2 pound sugar	....	....	7.92	3 1-2
3 pounds potatoes	.96	....	9.94	4 1-4

1 1-2 pounds flour	2.88	.36	17.16	4 1-2
1 quart whole milk	1.16	1.23	1.65	7
3 pounds bread	2.88	.24	24.90	6 9-10
1-4 pound Farina	.42	....	3.03	1 3-4
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
Total	21.68	16.12	79.09	75
Required	19.19	12.42	78.03	78

BILLS OF FARE, CLASS II.

For family of six. Average price, $1.26 per day, or 21 cents per person.

The bills of fare in this class will not be given in detail. Taking those given for Class I. as a basis, it is expected that certain luxuries will be added and a better quality of food used; the quantities of proteid, fat, and carbohydrate will then not be lowered, which is the point of greatest importance.

BILLS OF FARE, CLASS III.

For family of six. Average price, $1.38 per day, or 23 cents per person.

SATURDAY, MAY.

Breakfast— Oranges, egg omelet on toast, boiled rice with milk and sugar, coffee.

Dinner— Beef soup with egg sponge (p. 284), macaroni with cheese (p. 258), dandelion greens, bread.

Supper— Sour cream soup (p. 281), meat croquettes (of soup meat) (p. 230), graham bread and butter, tea, cake.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
1 pound rice	1.28	.16	12.24	8
1-2 pound sugar	....	....	7.92	3 1-2
6 oranges	....	....	....	10
3-4 pound macaroni	1.08	....	9.18	12 3-4
4 pounds bread	3.84	.32	33.22	9 1-5
2 pounds flour	3.84	.48	22.88	6
1-8 pound coffee	....	....	....	3 2-5
2 quarts whole milk	2.32	2.46	3.30	14
10 eggs	1.70	1.60	....	15
2 1-2 pounds meat	8.40	2.20	....	20
3-4 pound butter	....	9.99	....	18 3-4
1-2 pound fat cheese	2.00	2.32	.16	7 1-2

Sour cream and flavors for soup	....	....	....	6
Tea	....	....	....	2
Total	24.46	19.53	88.90	136 1-10
Required	19.19	12.42	78.03	138

SUNDAY, MAY.

Breakfast — Oatmeal mush with sugar and milk, bread and butter, coffee.

Dinner — Ham and eggs, salad of cold beans and lettuce, rhubarb pie, cocoa, bread.

Supper — Rice pancakes (p. 260) with sugar syrup, stewed potatoes, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
3-4 pound oatmeal	1.74	.72	7.80	3 4-5
1-8 pound coffee	....	....	....	3 2-5
1 pound sugar	....	....	15.84	7
2 quarts whole milk	2.32	2.46	3.30	14
3-4 pound butter	....	9.99	....	18 3-4
1 pound ham	3.84	5.84	....	25
1-8 pound suet	...	1.96	....	1
12 eggs	2.04	1.92	....	18
Cocoa	....	....	....	4
3 pounds potatoes	.96	....	9.94	3 3-4
4 pounds bread	3.84	.32	33.20	9 1-5
1-2 pound lettuce	.10	....	.20	5
1 pound beans	3.68	.32	8.55	5
Rhubarb	....	....	....	4
1-2 pound rice	.64	.08	6.12	4
1 1-2 pounds flour	2.88	.36	17.16	4 1-2
Tea	....	....	....	2
Salad dressing	....	....	....	5
Total	22.04	23.97	102.11	137
Required	19.19	12.42	78.03	138

MONDAY, MAY.

Breakfast — Oranges, milk toast, coffee.

Dinner — Roast mutton and bread dressing (p. 231), mashed potatoes, corn mush with sugar and milk, soda cream (p. 289).

Supper — Parsnip soup (p. 278) with yeast dumplings (p. 283), bread and butter, sponge cake, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
3 1-2 pounds bread	3.36	.28	29.06	8 1-10
3 pounds mutton	8.16	2.88	....	48
2 quarts whole milk	2.32	2.46	3.30	14
1 1-2 pounds sugar	....	....	23.76	10 1-2
1 pound flour	1.92	.24	11.44	3
1-2 pound butter	....	6.66	....	12 1-2
1-8 pound coffee	....	....	....	3 2-5
6 oranges	....	....	....	10

2 pounds corn meal	3.14	1.20	22.40	6
4 eggs	.68	.64	....	6
3 pounds potatoes	.96	....	9.94	3 3-4
Tea	....	....	....	2
Soda cream	....	....	....	3
Parsnips	....	....	....	6
Total	20.54	14.36	99.90	136 1-4
Required	19.19	12.42	78.03	138

TUESDAY, MAY.

Breakfast — Buttered toast, coffee, canned fruit.

Dinner — Sorrel soup (p. 279), fried catfish, noodles (p. 258), bread, swelled rice pudding (p. 270).

Supper — Fried mush, stewed rhubarb, fresh rusks and butter (p. 264), tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
Canned fruit	....	....	....	15
2 pounds corn meal	3.14	1.20	22.40	6
3 pounds bread	2.88	.24	24.90	6 9-10
1 1-2 quarts whole milk	1.74	1.86	2.50	10 1-2
2 quarts skimmed milk	2.12	.48	3.30	8
Rhubarb	....	....	....	8
2 pounds flour	3.84	.48	22.88	6
1 pound butter	....	13.33	....	25
1-2 pound sugar	....	....	7.92	3 1-2
Sorrel, etc., for soup	....	....	....	5
1-2 pound rice	.64	.08	6.12	4
1-4 pound suet	....	3.92	....	2
3 pounds fresh fish	8.00	.24	....	18
1-8 pound coffee	....	....	....	3 2-5
4 eggs	.68	.64	....	6
Tea	....	....	....	2
Total	23.04	22.47	90.02	129 3-10
Required	19.19	12.42	78.03	138

SATURDAY, SEPTEMBER.

Breakfast — Hominy mush with sugar syrup, stewed pears, toasted crackers, coffee.

Dinner — Plum soup (p. 282), broiled beefsteak, boiled green corn, turnips and potatoes (p. 276), bread, apple pie (p. 271).

Supper — Irish stew, biscuit and butter, yeast doughnuts (p. 264), tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
1 pound hominy	1.58	.60	11.20	5
Pears and plums	....	....	....	5
2 pounds bread	1.92	.16	16.60	4 3-5
1 2 pound crackers	.50	....	4.15	5
2 pounds beefsteak	6.72	1.76	....	36
1 dozen green corn	....	....	....	15

2 pounds potatoes	.64	....	6.62	2 1-2
Apples	....	....	....	4
1 pound turnips	.15	....	1.12	7-10
3 pounds flour	5.76	.64	34.32	9
1-8 pound suet	....	1.96	...	1
1 pound mutton	2.72	.96	....	8
3-4 pound butter	....	9.99	....	18 3-4
2 eggs	.34	.32	....	4 1-6
Tea	....	....	....	2
1 pound sugar	....	....	15.84	7
1 quart whole milk	1.16	1.23	1.65	7
1-8 pound coffee	....	....	....	3 2-5
Total	20.83	17.62	91.50	138 1-10
Required	19.19	12.42	78.03	138

SUNDAY, SEPTEMBER.

Breakfast — Sour milk pancakes with sugar syrup (p. 267), sausage, bread, cucumbers, coffee.

Dinner — Green corn soup (p. 278), fricasseed chicken (p. 235), potatoes and carrots (p. 276), with fried onions, bread.

Supper — Fried farina pudding (p. 270), water toast, radishes, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
Radishes	....	....	....	3
1 pound sausage	2.32	6.00	....	12
3-4 pound sugar	....	....	9.90	5 1-4
1 1-2 quarts whole milk	1.74	1.85	2.48	10 1-2
3 pounds bread	2.88	.24	24.90	6 9-10
1-2 dozen green corn	....	....	....	7 1-2
An old chicken (3 pounds)	9.00	1.90	....	50
2 pounds potatoes	.60	....	6.60	2 1-2
1-2 pound carrots	....	....	.72	1
Cucumbers	....	....	....	2
1 1-2 pounds flour	2.88	.36	17.16	4 1-2
1-2 pound farina	.84	....	6.00	2 1-2
1-4 pound butter	....	3.33	....	6 1-4
1 quart sour milk	1.06	.24	1.65	4
Coffee	....	....	....	3 2-5
Tea	....	....	....	2
2 eggs	.34	.32	....	4 1-6
Total	21.66	14.24	69.41	127 2-5
Required	19.19	12.42	78.03	138

MONDAY, SEPTEMBER.

Breakfast — Codfish balls, bread and butter, coffee, stewed apples.

Dinner — Roast beef, baked potatoes, stewed tomatoes, lemonade, bread.

Supper — Berry roly-poly (p. 271), cheese, bread and butter, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
3-4 pound codfish	3.60	....	....	6

4 pounds potatoes	1.28	....	13.24	5
3 pounds bread	2.88	.24	24.90	6 9-10
3-4 pound butter	....	9.99	....	18 3-4
2 quarts whole milk	2.32	2.46	3.30	14
1 pound sugar	....	....	15.84	7
2 1-2 pounds beef	8.40	2.20	....	40
3 pounds tomatoes	....	....	4.00	5
Lemons	....	....	....	7
1-2 pound flour	3.88	.36	17.16	4 1-2
1-2 pound fat cheese	2.00	2.32	.18	7 1-2
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
Fruit	....	....	....	10
Total	24.36	17.57	78.62	137
Required	19.19	12.42	78.03	138

TUESDAY, SEPTEMBER.

Breakfast — Broiled mackerel, stewed potatoes, bread and butter, coffee.

Dinner — Sour cream soup (p. 281), roast mutton with bread stuffing, boiled beets, bread pudding (p. 272, No. 2).

Supper — Apple fritters (p. 275) with sugar syrup, bread and butter, tea.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
1 1-2 pounds flour	2.88	.36	17.16	4 1-2
4 eggs	.68	.64	....	8 1-3
2 quarts whole milk	2.32	2.46	3.30	14
1 pound sugar	....	....	15.84	7
1-8 pound suet	....	1.96	....	1
2 1-2 pounds mutton	6.80	2.40	....	40
2 pounds beets	....	....	3.00	5
11-2 pounds salt mackerel	4.56	3.00	....	18 3-4
1 1-2 pounds potatoes	.48	....	4.96	1 9-10
4 pounds bread	3.84	.32	33.20	9 1-5
1-2 pound butter	....	6.66	....	12 1-2
Sour cream and apples	....	....	....	8
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
Total	21.56	17.80	79.46	135 1-2
Required	19.19	12.42	78.03	138

SATURDAY, JANUARY.

Breakfast — Buckwheat cakes and sugar syrup, bread and butter, coffee.

Dinner — Roast fresh pork with apple sauce, mashed potatoes, Indian pudding (p. 272), bread.

Supper — Herring and potato salad, lentils with prunes (p. 276), bread and butter, tea.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
2 pounds buckwheat flour	3.04	.64	23.20	10
1 1-2 pounds corn meal	2.28	.91	16.80	4 1-2

1 pound butter	....	13.33	....	25
3-4 pound sugar	....	....	11.88	5 1-4
1 quart whole milk	1.16	1.23	1.65	7
Apples	....	....	....	4
2 1-2 pounds fresh pork	8.00	2.80	....	37 1-2
3 pounds potatoes	.96	....	9.94	3 4-5
2 eggs	.34	.32	....	4 1-6
1 quart skimmed milk	1.16	.24	1.65	4
3 pounds bread	2.88	.24	24.90	6 9-10
1-2 pound lentils	2.04	.16	4.32	5
1-2 pound prunes	.15	....	3.80	5
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
6 herrings	1.68	.68	....	5
Salad dressing	....	....	....	5
Total	23.69	20.55	98.14	137 1-2
Required	19.19	12.42	78.03	138

SUNDAY, JANUARY.

Breakfast — Milk toast, fried potatoes, coffee.

Dinner — Cold roast pork, noodles (p. 258), stewed cabbage, bread, swelled rice pudding (p. 270), corn coffee (p. 289).

Supper — Potato soup (p. 277), grated cheese, bread and butter, raised cake (p. 264), canned fruit, tea.

	Proteids.	Fats.	Carbo-hydrates.	Cost in Cents.
	oz.	oz.	oz.	
1-4 pound fat cheese	1.08	.95	.06	3 3-4
4 pounds potatoes	1.28	....	13.24	5
2 pounds flour	3.84	.48	22.88	6
4 eggs	.68	.64	....	8 1-3
2 quarts whole milk	2.32	2.46	3.30	14
1 quart skimmed milk	1.06	.24	1.65	4
3-4 pound butter	....	9.99	....	18 3-4
1 pound sugar	....	....	15.42	7
2 pounds fresh pork	6.40	2.24	....	30
2 pounds cabbage	.80	....	1.60	8
1-2 pound rice	.64	.08	6.12	4
3 pounds bread	2.88	.24	24.90	6 9-10
Corn (dry grain)	....	....	....	2
Canned fruit	....	....	....	10
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
Total	20.98	17.32	89.17	133 1-10
Required	19.19	12.42	78.03	138

MONDAY, JANUARY.

Breakfast — Buckwheat cakes, sausage, coffee, apple sauce.

Dinner — Pea soup (p. 277), roast beef, baked potatoes, canned tomatoes, barley gruel (p. 289.)

Supper — Potato soup with egg and bread balls (p. 284), brown bread and butter, canned fruit, tea.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
2 pounds buckwheat flour	3.04	.64	23.20	10
1 pound sausage	2.32	6.00	....	12
2 pounds beef	6.72	1.76	....	32
3 pounds potatoes	.96	....	9.94	3 3-4
2 pounds tomatoes (canned at home)	.19	....	3.50	6
3 pounds bread	2.88	.24	24.90	6 9-10
2 eggs	.34	.32	...	4 1-6
1-2 pound barley	.88	.12	5.72	4
1 quart whole milk	1.16	1.23	1.65	7
1-2 pound sugar	....	....	7.92	3 1-2
1 pound dried peas	3.68	.32	8.32	5
1-2 pound butter	....	6.66	....	12 1-2
Canned fruit	....	....	....	10
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
Apples	....	....	....	5
Total	22.17	17.29	85.15	127 1-5
Required	19.19	12.42	78.03	138

Tuesday, January.

Breakfast — Graham biscuits, fried bacon, apple sauce, coffee.

Dinner — Boiled mutton, baked potatoes, winter squash, dried apple shortcake with pudding sauce, corn coffee.

Supper — Mutton and bean broth, bread and butter, cheese, tea, cookies.

	Proteids.	Fats.	Carbohydrates.	Cost in Cents.
	oz.	oz.	oz.	
3-4 pound bacon	.36	9.66	....	9
1-2 pound dried apples	.10	....	4.44	6
1 pound beans	3.68	.32	8.56	5
1-4 pound fat cheese	1.00	1.16	..	3 3-4
1 pound sugar	....	....	15.84	7
2 quarts whole milk	2.32	2.46	3.30	14
2 1-2 pounds mutton	6.80	2.40	....	30
3 pounds potatoes	.96	....	9.94	3 3-4
2 pounds winter squash	.16	....	3.20	10
Cookies	....	....	....	15
2 pounds bread	1.92	.16	16.60	4 3-5
2 1-2 pounds flour	4.80	.60	27.94	8 1-2
1-4 pound butter	....	3.33	....	6 1-4
1-8 pound coffee	....	....	....	3 2-5
Tea	....	....	....	2
Apples	....	....	....	5
Total	22.10	20.09	89.82	132 7-10
Required	19.19	12.42	78.03	138

TWELVE COLD DINNERS.

If a man is to eat a cold dinner for months or even for weeks, it is quite worth while to make that dinner as good as it can be, and to pack it nicely for carrying. Every one knows how it can take the edge off even a keen appetite to find his sandwich smeared with apple pie, or his cake soaked with vinegar from the pickles. That a box or basket of given dimensions should hold as much as possible, and keep the different kinds of food separate, it must be divided into compartments. Simplest, an oblong basket; divide into two compartments by a piece of pasteboard cut so that it slips in rather tightly, then line the two compartments with nice wrapping paper put in fresh every day. It may be divided into four parts in the same way. A close fitting tin spice-box is nice for holding cheese. A tiny "salve" box should contain salt and pepper mixed. Sew leather straps on the cover of the basket inside, for holding knife, fork, and spoon. Put a strap around the basket, that you may hang from it a little pail containing cold soups recommended for drinks in summer. Cold puddings should be wrapped in strong writing paper, then in wrapping paper, and pinned close.

COLD DINNERS FOR SUMMER.

1. Bread and butter, salad of potatoes and cold baked fish, cold boiled beef, molasses cookies, apple soup.
2. Corn bread, ham sandwiches, baked sweet apples, custard pie, plum soup.
3. Bread and butter, cold veal, hard boiled eggs, pickled beets, cherry pie.
4. Chopped beef sandwiches, salad of lima beans, ginger snaps, cottage cheese, Irish moss lemonade.
5. Graham bread, cold roast mutton, cucumbers and salt, pumpkin pie, soda cream.
6. Bread and butter, dried beef, crackers, cheese, sponge cake, cold coffee.

COLD DINNERS FOR WINTER.

7. Bread, cold boiled pork, cold baked beans with mustard and vinegar, doughnuts, apple pie, cold coffee.

8. Yeast biscuits and butter, cold chicken, pickles, cold rice pudding, apples.

9. Cold soda biscuits, veal and ham sandwiches, saratoga potatoes, mince pie.

10. Biscuits and butter with honey, cold corned beef and rye bread, dried apple tarts, cheese.

11. Bread and butter, smoked herring, pickled beans, gingerbread, apples.

12. Corn bread and butter, cold roast beef and white bread, bread and apple pudding, bread cake.

PULMONARY TUBERCULOSIS. *

BY IRVING A. WATSON, A. M., M. D., SECRETARY STATE BOARD OF HEALTH, CONCORD, N. H.

I.

Pulmonary consumption either is or is not contagious. If it is contagious, then the lives of a very large part of the human race, — individuals and families in every neighborhood, — are dependent in a great measure upon organized efforts to restrict its spread. If it is not contagious, the efforts should be none the less determined in modifying or removing such unhealthful environments as are known or supposed to have an influence in the propagation of this fearful disease. On the one hand the work of restriction differs very materially and radically from that of the other, so it is of the utmost importance that the question be determined as far as possible beyond the point of controversy, in order that uniform and scientific methods of prevention may be inaugurated. The great weight of evidence to-day preponderates decidedly to the support of the theory of contagion, although there are many physicians who have not seen sufficient proof to believe in its contagiousness. In support of their view it is argued that isolated cases of consumption are to be found in almost every community, while even other members of the family and associates do not contract the disease. It is also cited that the records of hospitals for the treatment of consumption show that the attendant physicians and nurses rarely if ever contract the disease. Particularly are

* The first section of this paper was originally presented at a regular meeting of the New Hampshire Centre District Medical Society, to open the discussion of the question: "Is Phthisis Pulmonalis contagious, and should the Profession advocate more strenuous means of preventing the spread of the disease?"

the statistics of the Brompton Hospital, England, brought to the support of this theory. These records embrace the personal history of thousands of patients, extending over a period of more than thirty years, and in not a single instance can it be shown that the attendant physicians contracted the disease, while the percentage of consumptive cases among the nurses was very low.

It must be borne in mind that nearly all the evidence against the theory of the contagiousness of consumption is of a negative character. Exemption from this or any other disease can only be regarded as a sort of corroborative evidence, although it is not infrequently used as argument against facts established by scientific research even.

The theory that consumption is contagious is not new. The idea has been entertained and not infrequently expressed by observing physicians for many generations. Two hundred years ago Morton, writing upon consumption, says: "This disease is also propagated by infection, for this distemper, as I have observed it by frequent experience, like a contagious fever doth infect those that lie with a sick person with a certain taint." Even in the older medical journals may be found the history of consumptive cases in which it is averred that the disease is contracted by other members of the family or by the nurse through infection.

A belief in the contagiousness of the disease has always been entertained by a small minority of the medical profession, but not until the year 1882 was there any tangible evidence, worthy of general acceptance, presented. When in that year Dr. Robert Koch, of Germany, in a very unpretentious manner informed the Physiological Society of Berlin that he had discovered the bacillus of tuberculosis, the announcement was received with little credence by the profession, and had it not been for the fact that by following in his methods of investigation microscopists in every part of the world were able to isolate this same bacillus, the fact would probably have not yet been accepted. Under the specific directions given by Dr. Koch, it was an easy matter for any physician to isolate this bacillus in the sputa of his own consumptive patients; therefore, the existence of the bacillus tuberculosis is a fact settled beyond all controversy.

A failure to discover the bacillus in a case of phthisis pulmonalis cannot be regarded as evidence of the non-existence of the

germ. In discussing this point before the New York Academy of Medicine, Dr. Roosevelt emphasized the fact that in phthisis we often have no tubercle so situated as to be connected with the air passages, and in such cases the sputa would contain no bacilli, although extensive tubercular deposit might already have taken place. It is also possible that the bronchial discharge might be so great that the bacillus would be overlooked in the examination. Therefore no one should deny the existence of phthisis because the bacillus is not found, for even after the most careful examination it cannot positively be asserted that the disease does not exist, on this ground alone.

The next question, over which there has been considerable dispute, is as to whether the bacillus tuberculosis is the cause of consumption or only an accompanying product. This same question was for a long time an unsettled problem in other germ diseases, but the investigations and experiments that have been made with the bacilli of other diseases, especially those affecting domestic animals, have practically banished all doubt upon this point. In the experiments alluded to, the germ or bacillus of the particular disease under investigation has been carefully and completely isolated from all other products, and the disease again and again reproduced by means of vaccination with the bacillus alone. So extensive and varied have been these experiments that there is left but the shadow of a doubt for discussion in this direction.

It is fair to assume that the experiments made in the germ diseases of animals which have led to these conclusions will apply with equal force to consumption or any other germ disease in the human family. It is true that through lack of opportunity to make clinical experiments upon the human subject in these diseases the conclusions are not as positive as those in regard to anthrax, swine plague, etc., among domestic animals. A large number of inoculative experiments, however, have been made with the bacillus tuberculosis upon Guinea pigs, rabbits, and other animals, with the result of almost invariably producing tuberculosis. In those instances in which there has been a failure to reproduce the disease by inoculation, the result was believed to be due to the introduction of an imperfect virus or because the animal possessed sufficient powers of resistance to repel the invasion of the disease.

A large number of inoculative experiments might be cited to

support this theory, but they are to be found in all the leading medical journals, together with a complete account of the manner of manipulating the bacillus and all other details connected with the experiments. The character of the testimony which has been presented in support of the theory of the contagiousness of consumption should also receive consideration. It is to be borne in mind that this great mass of evidence comes almost entirely from the labors of pathologists and biologists. These workers have long been engaged, many of them for years, in studying this question, and it is a fact that these scientists, among them the most noted physicians of the age, entertain a most remarkable unanimity of opinion upon this question. This evidence, coming from the source it does and with its attendant circumstances, may be regarded as well-nigh conclusive.

On the other hand, it is to be noted that that part of the profession which opposes this view base their opposition almost entirely upon clinical experience. It would seem that in candidly considering the two sides, the latter is entitled to very little weight compared with the positive and overwhelming evidence of the former.

All the results of the etiological study of disease during the past ten years or more, confirm step by step the belief in a specific germ or cause for every specific disease. A great variety of bacilli have been discovered, some of which are known to be the cause of disease, while others, so far as their life history is known, are innocuous. So firmly is the belief in a specific cause for a specific disease fixed in the minds of the most advanced students and thinkers in the medical profession that experimental researches have been going on for years for the germ of a single disease, and although not yet discovered, the workers are as positive as ever that success will eventually reward their efforts.

The old idea that a specific disease may be produced by a variety of causes, does not hold good in the light of modern science; it is irrational in theory, and at variance with science, and it is not unreasonable to expect that the exact cause of every independent and specific disease may yet be discovered. The bacillus of consumption is an entity which is to-day well understood. It is successfully cultivated and transplanted to different

animals with the result of producing the disease in a typical form in every case where there is not some accountable reason for failure.

The life history of the bacillus tuberculosis, so far as its behavior in living animals is concerned, is accurately and definitely known. Its growth has been successfully carried on outside the animal body, under favorable conditions, in the laboratory; but it is not generally believed that this bacillus multiplies outside the animal body, except under favorable conditions artificially provided; neither is it believed to be propagated in any media in which it finds lodgment when expelled from the animal body. Various experiments have been made to determine, if possible, to what extent the vitality of the bacillus is perpetuated under the varying conditions, climatic and other, to which it would naturally be subjected upon leaving the body.

It is conceded that the bacillus is more largely distributed by the sputa than by any other means; it is also believed that the vitality of the germ remains undiminished for a long time after the sputa has become dried and perhaps pulverized. Successful inoculative experiments have been made with the dust collected from rooms occupied by tuberculous patients. Carnet experimented with dust obtained from the walls and floors of rooms which had been occupied by such patients, successfuly inoculating Guinea pigs that had been carefully excluded from every other source of infection. He collected dust from twenty-one rooms of seven Berlin hospitals for the treatment of tuberculous patients, and found the bacillus tuberculosis present in nearly every instance. He also collected dust from the rooms of tuberculous inmates at the insane asylums and penitentiaries, and in it readily found this bacillus. He also examined the dust in the dwellings of fifty-three tuberculous patients, and that collected on the premises of twenty of them was found to be virulent. The bacillus was invariably found in the dust from rooms of patients who expectorated upon the floor or into a handkerchief; while it was not found where the patients used spit-cups. It is recognized as a fact by all observers that the bacillus is never wafted about or disseminated from moist surfaces, — a most important suggestion in connection with its restriction. Other investigators have examined the dust from rooms of tuberculous

patients, and have arrived at practically the same conclusions as Carnet.

All examinations of the exhaled breath of consumptives have failed to reveal the presence of the bacillus. Tappeiner, Bolinger, Grancher, Cadeac, Mallet, and others, have made experiments to determine this question. Tappeiner caused a patient in the last stages of consumption to cough frequently into a box in which two rabbits were confined. The animals were subjected to this treatment for two months, but remained healthy. Bolinger caused tuberculous patients to breathe upon surfaces moistened with glycerine, but was never able to find any entrapped bacilli, and therefore came to the conclusion that the infection is not communicated by the breath. Grancher experimented with the breath of consumptives exhaled into rubber bags in which were Guinea pigs; the animals were treated in this way for several weeks, but no indication of tuberculosis showed itself. Other investigators have made like experments with similar results.

The theory that consumption is an hereditary disease is fast losing its hold upon the professional mind, although it is still regarded as possible, by some observers, that the disease may be transmitted from mother to child. If this be true, it is probable that the inheritance is always manifested in the earlier months of childhood, or at the farthest, during the first years of life. If the disease is transmitted, the child must be tuberculous at birth; and to believe that the inherited bacilli can remain dormant for half a century or more, and then spring into activity, is not in accord with the morphology of germ life.

Hutinel, of the *Hospital des Enfants Malades*, in a paper upon the heredity of tuberculosis, says that we are warranted in affirming that communication of the disease by the father is not proven, and is exceedingly doubtful; but that transmission by the mother may take place, but is extremely rare. Nevertheless, heredity exists, and if the children of consumptive parents are not born tuberculous, they are tuberculizable; that is, they have inherited what he terms a culture soil favorable to its development. In other words, there is transmitted an abnormal susceptibility to the disease, owing to more favorable conditions for the development of the germ, or through the absence of that resisting power

found in persons of greater physical perfection. It is inconceivable how the bacillus can be transmitted to children and remain dormant for years, and then spring into activity. Such a position is untenable in the light of modern science, while the theory of transmitted susceptibility is wholly rational, and does not conflict with our latest and most accurate investigations. It would be fully as rational to speak of a typhoid diathesis as of a "tuberculous diathesis," neither of which has any existence. It is true, and a matter of observation among all practicing physicians, that the offspring of diseased or physically imperfect parents, show a diminished power of resistance to disease, and are especially liable to tuberculosis. That the children of such parents readily contract this or any other infectious disease, should not lead us to pronounce such disease to be hereditary. We cannot doubt that there is a congenital lack of resistance to the infection of tuberculosis, as well as to some other diseases; but that the disease itself is hereditary, there is no evidence capable of demonstrating.

In order to formulate methods for the restriction of tuberculosis, we must have an intelligent understanding of the manner in which it is communicated or spread. The history of the disease thus far given carries with it, inferentially, a more or less logical idea of what is necessary to prevent its propagation. There are many avenues, however, through which the disease may be received that have not been mentioned. In discussing this point, Koch expresses himself as follows:

> In regard to the way in which the tubercle virus is communicated from the consumptive patient to the well, there can be no doubt. During attacks of coughing, particles of the viscid sputum are ejected into the air and, to a certain extent, atomized. Now numerous experiments have taught that the inhalation of atomized tubercular sputum makes animals tuberculous with absolute certainty, not only those which are very susceptible to tuberculosis, but also those which are usually immune. That man, in this respect, is an exception, is not to be assumed. When, therefore, accidentally, a healthy person inhales a particle of sputum freshly expectorated, we may presume that he may become infected. Yet infection will not often occur in this manner, because the particles of sputum are not so small that they can remain suspended in the air. Far more likely to produce infection is the dried sputum, which on account of the careless way with which the expectoration of consumptives is cared for, evidently gets into the air in considerable quantities. Not only is the sputum

expectorated directly upon the floor in some cases, there to be dried, trodden upon, and to be swept into the air in the form of a powder, but the clothing and the coverings of the bed, and the pocket handkerchief are soiled with the infectious material that, drying, becomes pulverized.

Dr. Richard, in a paper read before the *Société de Medicine Publique* three years ago, in speaking of the danger from tuberculosis, says:

The expectoration begins to be really dangerous when in the effort of coughing, through awkwardness or heedlessness, it is projected upon the bed, the clothing, the bed clothes, the walls, the floor, or when it is received in the handkerchief. Then rapidly drying, it becomes friable, is pulverized and disseminated, and henceforth the atmosphere of the room may be considered as virulent for a long time. The sputum falling on the bedding, the mattress, sheets, blankets, or on the handkerchief, once dry, is detached at each movement of the patient, and especially when the bed is made it goes to rejoin that portion which has been launched directly upon the floor, and that which, after desiccation, has fallen from the walls. All is trampled under foot and is reduced to a powder finer and finer. This infectious powder goes and comes; the currents of air, the frolics of children, the strokes of the broom raise it and make it float in the air, where it remains suspended for a while to finally fall on the bed, the furniture, the walls, the floor. That part which is taken up by the bed is the most stable, the woolen blanket or coverlid is like a sponge which stores up the powder with a prodigious facility; that of the furniture and walls is displaced often, and each time it is raised a new portion goes to increase the store which is in reserve in the blankets, which finally may be considered as the natural reservoir of all the powder in the apartment.

If this statement is not overdrawn — and scientific research is in accord with its declarations — we can readily account for the appearance of any case of tuberculosis that may come to our knowledge. There are many channels through which this germ is communicated to others. The conclusions arrived at by a commission appointed by the Congress of Tuberculosis, and reported to the Academy of Medicine of Paris, are that the bacillus of tuberculosis may penetrate the human organism either through the lungs by means of the inspired air, through the digestive tract, and through the skin and mucus membrane by means of abrasions, punctures, wounds, or ulcerated surfaces.

In discussing its communicability by means of foods, we would be obliged to go over the entire ground of bovine tuberculosis, which in itself is a deep and interesting study and has already developed to very great proportions, through the work done by

medical and veterinary scientists. It is conceded by most, if not all, the practical workers in this field, that bovine and human tuberculosis are identical. This fact is so well established that at the present time there is little controversy over this point.

The interesting and practical question in connection with it is, To what extent is the human family subjected to the dangers of infection through bovine tuberculosis? Upon this subject much has been written of late, and all the conclusions formulated lead to the belief that bovine tuberculosis is responsible for quite a large proportion of tuberculous cases in the human family.

Fleming estimates that five per cent of all the cattle in England are affected with tuberculosis. Dr. Brush, in a paper read before the Medical Society of the State of New York a short time since, stated that the inspectors of the Bureau of Animal Industry of the United States, have found a much larger percentage of our cows affected with the disease. Among some of the thoroughbred Jerseys, twenty per cent or more have been found to be infected. Professor McLean, who is connected with the Bureau of Animal Industry, states that where cows are affected with tuberculosis in great numbers, the death rate from this disease is correspondingly large in the human family in the same districts.

Dr. Brush, in the paper referred to, expresses the belief that human bacilliary tuberculosis is all derived from the bovine species, and that where this animal does not exist, pulmonary consumption is unknown. The Kirghis on the steppes of Russia, who have no cows, have domesticated the horse, using its milk, meat, and skin, and a case of pulmonary tuberculosis has never been known to exist among the tribe. He also states that the Esquimaux have no cows, neither have they pulmonary phthisis. The belief that pulmonary tuberculosis is due to the wide-spread existence of the same disease in the cow, is also entertained by many other observers.

The bacillus may be found in the milk, muscles, and blood of the infected animals. Until recently it was not supposed that the bacillus could be communicated to the milk until the udder had become diseased; but this has been disproven. Dr. Peters, the able veterinary biologist at the experimental station in Massachusetts, where he has had for months a herd of tuberculous cows under inspection and investigation, informed the

writer that he had succeeded in finding the bacillus of tuberculosis in the milk of cows whose udders showed no indication of the disease. Bolinger, in investigating this point, found the milk infected in eighty per cent of the tuberculous cows examined. In cows with moderate tuberculosis, the milk was infected in fifty-five per cent of the cases, and in cows in which the disease was only slightly indicated, the milk was infectious in thirty-three per cent of the cases.

These are only a few of the many facts now on record, relating to bovine tuberculosis. Upon examining all the evidence there is left scarcely room to doubt that tuberculosis is not infrequently communicated from the bovine species to man. It would seem, then, that the human family is subjected to the infection of this disease from two great sources, tuberculous persons and tuberculous cattle. This every candid student of the subject must admit; but there is still room for controversy and wide differences of opinion regarding the channels through which it is alleged the disease may be communicated; this causes a difference of opinion as to how far preventive measures should be carried.

From the facts already considered, the question, Should the profession advise more strenuous means of prevention? would seem to be superfluous. The answer must be emphatically in the affirmative. From the history of the disease thus far known, three propositions may be formulated:

1. That the bacillus tuberculosis is the cause of the disease.

2. That the disease, when developed after the first years of childhood, is not inherited but acquired.

3. That the disease is strictly preventable.

If these propositions are capable of demonstration, and we believe they are, the medical profession has an imperative and conscientious duty to perform in the field of prevention. Every intelligent physician of the present era recognizes that the prevention of disease should be as much a part of his duty as the treatment of sickness. The question of gratuitous philanthropy is not for a moment to be considered in this connection, for the true physician will use every rational and scientific means within his power for the prevention and restriction of disease, whatever may be the pecuniary result to himself.

Before any efficient work in the restriction and prevention of this disease can be done, the people, and our patients themselves, must have a full understanding of its nature. The simple assertion that the disease is communicable is not sufficient, for in many families, who have no definite understanding of the term, there would be constant fear of infection which would have a very detrimental effect upon the entire family. They ought rather to be taught the exact and definite channels through which the infection may be received ; the manner in which the tuberculous person renders himself dangerous, and the most efficient methods of avoiding the disease. It would be false and cruel to give a family the impression that any member of it who might be afflicted with tuberculosis was, *per se*, a source of constant danger to the others. The fact is that a consumptive having a reasonable understanding of the nature of his disease and who is discreet and careful in his habits need not endanger his associates.

The following may be stated as the chief requirements to be urged upon the public, and they are simple rules which the physician can readily and successfully teach in his own community, and that, too, without exciting any unnecessary apprehension or alarm :

1. That the greatest danger of infection is from the sputa of the consumptive.* For this reason, when confined to the house, a spit-cup or spittoon should be used, and when upon the street a handkerchief to receive the expectorations. The spit-cup and spittoon might preferably contain a disinfectant, but if these vessels are frequently and thoroughly cleansed with boiling water, disinfectants are not an absolute necessity. The handkerchiefs used should be immersed in boiling water at least daily, — *before the sputum has become dried.*

2. No person should occupy a sleeping-room with another who has tuberculosis, although such practice is almost universal and many persons escape infection.

3. The eating utensils of a consumptive should be washed in boiling water, and care should be exercised that the same glasses, spoons, etc., are not, before being washed, used by children and

* Since this paper was written, the American Public Health Association, at its annual meeting, 1889, after a thorough consideration of the subject adopted the following :

Resolved, That it is the sense of this Association in the interest of public health that the community should be instructed that the destruction of the sputa of tuberculous patients is an absolutely essential part of the means of preventing the spread of the disease.

others. The patient should also avoid kissing others or placing in his mouth any article likely to be used or handled by others.

4. The dejections of consumptive patients, in cases where the bowels are affected, should be thoroughly disinfected.

5. Perfect cleanliness of the apartments occupied by consumptives should be urged in all cases. The bed linen, towels, etc., should be very frequently put through the operations of the laundry, while the walls should be frequently cleansed and dressed anew. In fact, the whole question of restriction may be expressed in the one word "cleanliness."

With a knowledge of what should be done in consumptive cases, the people will understand in a very great measure how to avoid the dangers arising from direct communication with them. Beyond the measures suggested by such knowledge are the dangers arising from tuberculous milk and meat. From the evidence already submitted we are led to believe that the liability of infection from these sources is very great. To insure public protection against this source of danger, it would be necessary to exercise a careful sanitary supervision over the sources of our meat and milk supplies. This can be done thoroughly only by the state or nation, but the medical profession can do much in bringing to light tuberculosis in cattle and reporting the same to the local authorities, who, under a law recently enacted in this State, have full powers to destroy such animals and re-imburse the owners.

The measures of prevention which have just been outlined are brief, simple, and not calculated to arouse undue fears in families or communities. It has been said that if nine avenues through which a disease may come are closed and one left open, protection is not secured; but it should also have been said that nine tenths of the danger is thereby removed, other things being equal. So with the preventive measures suggested in this paper; if they are not sufficient to eradicate the disease, they will at least greatly reduce the liability to its infection.

Pulmonary consumption is the most terribly fatal disease that affects mankind. It is contagious and infectious; it is also preventable, and if the medical profession as a unit would accept this view and instruct the people in the means of its restriction and prevention, its mortality might be reduced one half in a single generation.

II.

There are nearly one thousand deaths annually in New Hampshire from the "great white plague," commonly known as pulmonary consumption, and if to this were added the deaths from other causes complicated with tuberculosis, the total would reach a much higher figure. The history of the disease has been the same from time immemorial; it has destroyed and is destroying more lives than any other disease known to mankind. It has been studied for generations by the ablest physicians in all parts of the world, but never till the present period of wonderful biological advancement has its true nature and character been revealed. The seed that produces this terrible harvest of death has been discovered, thereby placing pulmonary consumption on the list of "preventable diseases." It is only, however, through a slow process of education, of wide-spread, intelligent information, that a discovery or an invention calculated to further the public interests can be brought into the greatest practical utility, unless perchance it can be introduced through the medium of large pecuniary gains, which is not the case in dealing with the prevention of disease.

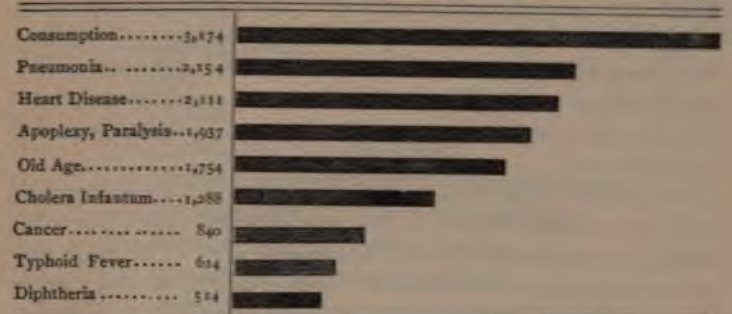
In order to secure the adoption of even the simplest measures necessary to restrict the spread of consumption, the public must be fully informed of its extensive prevalence, its contagious and infectious character, and its liability to appear at any age of life. In the foregoing paper its communicability and the necessary preventive measures have been briefly discussed.

The extent to which it prevails and its liability to infect persons of any age are more fully shown in the following diagrams. The first diagram illustrates the relative prevalence of the nine most prominent causes of death, as registered in this State during the years 1885, 1886, 1887, and 1888. It will be seen at a glance that consumption greatly exceeds the other causes of death given.

Although the registration of vital statistics in this State covers accurately only a very few years, it is reasonable to assume from the registration records of other States, covering a period of many years, that pulmonary consumption has always held the same relative position in the causes of death.

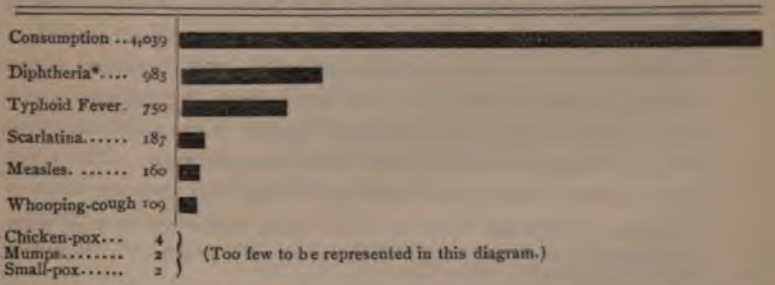
When this terrible death line is transferred to its proper class,

DIAGRAM 1. SHOWING RELATIVE PREVALENCE OF THE NINE MOST PROMINENT CAUSES OF DEATH FOR YEARS 1885-1888, INCLUSIVE.



the contagious diseases, its real importance is revealed in a much more startling manner. Diagram No. 2 shows the number of

DIAGRAM 2. SHOWING NUMBER OF DECEDENTS FROM NINE CONTAGIOUS DISEASES FOR THE YEARS 1884-1888 INCLUSIVE.



* Including pseudo-membranous croup.

deaths in this State from nine contagious diseases during the five years ending with 1888. Consumption heads the list with a total of 4,039 deaths, diphtheria follows with 983, less than one fourth as many as consumption, while small-pox, a disease terribly feared by the public and a single case of which produces widespread alarm, is charged with only two deaths during the same period, a number far too small to be represented in the diagram. This diagram alone is sufficient to show the ignorance that exists regarding the relative danger to life from the contagious diseases.

Small-pox, through the beneficent means of vaccination, has been robbed of its terrors, and in the table given rates with

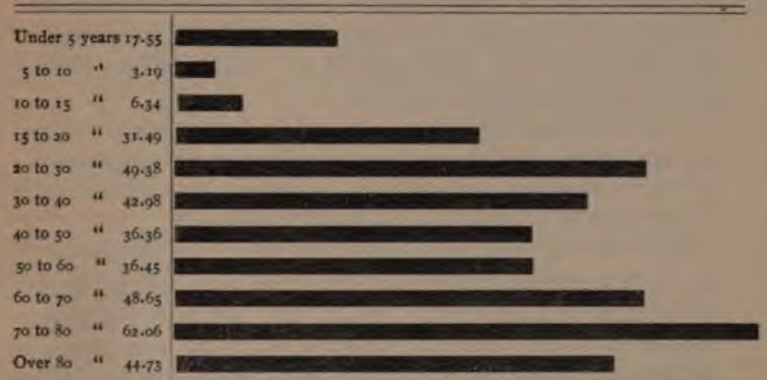
mumps; yet a single case of the former disease causes more general alarm than the loss of a thousand lives from consumption. While such opinions are entertained by the public, in opposition to facts proven by accurate registration of deaths, it is evident that prevailing sentiments and notions must be corrected before due attention will be given to legitimate and proper measures for the restriction and prevention of consumption, diphtheria, and typhoid fever.

The effect of preventive measures has already been made manifest in a marked degree, in the relatively low death rate from scarlatina compared with what it formerly was. The death-rate from consumption should also be reduced so that within a single decade the deaths from this cause should be materially reduced, and in one generation it should be at least one half less than it is now.

Diagrams Nos. 3 and 4 are given for the purpose of disproving the very erroneous idea prevailing in regard to the time of life at which persons are most subject to the disease. Diagram No. 3 is made up from the death returns in this State for a period of five years, from 1884 to 1888 inclusive, and includes 4,039 deaths; while diagram No. 4 is based upon the Massachusetts returns for a period of fifteen years ending with 1887, and embraces a total of 132,384 deaths from consumption. The similarity of the two diagrams is very striking, and they are worthy

DIAGRAM 3. SHOWING DEATH RATE FROM CONSUMPTION IN NEW HAMPSHIRE PER 10,000 OF THE POPULATION LIVING AT EACH AGE PERIOD, FOR THE YEARS 1884–1888 INCLUSIVE.

DIAGRAM 4. SHOWING DEATH RATE FROM CONSUMPTION IN MASSACHUSETTS PER 10,000 OF THE POPULATION LIVING AT EACH AGE PERIOD FOR THE YEARS 1863–1887 INCLUSIVE.



of consideration. The slight variations can readily be explained by conditions, social and otherwise, affecting the population, but that there is a definite law governing the mortality in certain age periods, is very evident from the diagrams given.

There is a very generally accepted belief that there is a greater susceptibility to consumption between the ages of twenty and thirty than at any other period of life. It is true that there are a greater number of deaths from consumption during this age period than at any other time of life, because the living population is correspondingly greater; but that there is any greater liability to the infection of the disease, so far as the individual is concerned, is not true. In this State the highest rate of mortality from consumption, based upon the living population of the several age periods, is from eighty years upwards, while in Massachusetts the highest rate occurs between the seventieth and eightieth years.

The diagrams also very forcibly illustrate the very slight susceptibility to the disease that exists between the ages of five and fifteen. It will therefore be seen that a person is not, during his entire lifetime, exempt from a liability to the disease; and, also, that the age period during which there is the greatest mortality from consumption does not necessarily present the highest death rate from the disease. Persons who assert that they have

passed the "consumptive period of life," have no true knowledge of the history of the disease, but have probably formed this opinion from observing that a greater number of deaths from consumption occur between the ages of twenty and thirty than at any other age of life, without taking into consideration the much greater population at that age period.

The preceding diagrams are presented for the purpose of illustrating as accurately and as vividly as possible the following points: 1. The widespread prevalence of pulmonary consumption, and 2. Its liability to appear at any age of human life.

With all the facts and figures that have been presented, it should be ineffaceably impressed upon the mind that pulmonary consumption is a preventable disease, and that with the observance of the simplest sanitary measures, which are now known to be sufficient to restrict the disease, hundreds of families have it in their power to save lives that under the prevailing sanitary neglect are inevitably doomed to this disease. State and local boards of health are, by circulars and through the public press, earnestly endeavoring to diffuse accurate information regarding preventive methods to be employed. The measures recommended are simple, and need only to be carried out with minute attention to details in order to be effective.

The following circular upon the prevention of pulmonary consumption was recently issued by the State Board of Health of Maine, and while not materially differing from instructions issued by other boards, is to be heartily commended to the public:

That insidious disease which we call consumption, phthisis, or tuberculosis of the lungs, is the most terrible destroyer of lives with which civilization has to contend. Centuries ago consumption was regarded as an infectious disease, in Southern Europe, and extravagantly rigorous laws were in existence regulating communication with consumptive patients. At the present time the fact of the infectiousness of consumption is firmly established in a scientific way, and enough is known of the natural history of the infective agent, the bacillus of tuberculosis, and of the ways in which it is communicated to man, to enable us to lay down rules with more positiveness than hitherto for the prevention of the disease.

The source of infection is twofold: from tuberculous animals to man, and from one human being to another. The tuberculosis of animals and human consumption are of the same nature. From domestic animals there is danger of contracting the disease by the use of flesh, and especially by the use of milk

rom those which are tuberculous. Many children die in their earlier years from various tubercular diseases, tubercular inflammation of the brain, "consumption of the bowels," etc., and it is now assumed, with much probability, that the great majority of these die from infection received in the milk from tuberculous cows, or in that from mothers suffering from tuberculosis in some form. By far the greatest source of infection, however, is consumptive human beings; but, fortunately, the ways in which the contagion is disseminated are but few, and by intelligent care they may be effectually controlled.

Practically, from the human source, we may consider the expectoration (the sputum) as the only serious danger. The consumptive sputum usually contains an abundance of the infection, the bacilli, and these microscopic organisms are found to be capable of retaining their vitality and their infectious qualities for a long while, even after the sputum has been thoroughly dried.

It has long been known that tuberculosis may be communicated to animals experimentally by feeding them with tuberculous matter, by injecting it into their tissues, or by causing them to breathe air into which tuberculous sputum had been atomized. More recently, since the discovery of the bacillus tuberculosis, it has been found that the bacilli may be cultivated upon artificial media, and that when thus cultivated and free from all other matter which might possibly be infective, tuberculosis may still be communicated to animals in the ways which have been mentioned above, and with great certainty.

Experiments, the conclusions from which can hardly be questioned, have shown that the breath of the consumptive patient is not infectious, and that the same may be said of the sputum as long as it remains moist. Another line of investigation has proved that the careless consumptive patient is a focus of infection, and a danger to all persons who come much in proximity to him, especially to those who dwell in the same rooms with him. The reason of this is that the expectoration of the patient spit upon floors, carpets, pocket handkerchiefs, or clothing, becomes dried and pulverized, and, floated in the air, still contains the infectious germs, and cannot be inhaled without great danger.

Though infection may be regarded as the principal, the essential cause of consumption, there are, nevertheless, various untoward influences which have much to do with increasing the death rate from this disease, and should never be disregarded. The most important of these are the breathing of impure air, particularly that of unventilated sleeping-rooms and living-rooms, the use of food not sufficiently nutritious, and dwelling upon a soil which is damp. How far heredity is a cause of consumption is, from the nature of the question, hard to determine. Since the infectiousness of the disease has been shown, many family groups of consumption, "house epidemics," may fairly be assumed to be from infection rather than from hereditary influence. Some able writers would discard heredity as one of the causes of tuberculous disease; but others, more conservative in their views, while believing that direct inheritance is rare, think that certain peculiarities of constitution, favoring susceptibility, are transmissible from parent to child.

RESUMÉ.

1. Tuberculosis is an infectious disease.
2. The breath of the consumptive patient is not infectious.
3. The sputum is harmless as long as it remains moist.
4. Tuberculous infection is produced, in the great majority of cases, by the inhalation of dried and pulverized tuberculous sputum.

PREVENTION.

THE RESTRICTION OF INFECTION.

It should be impressed upon consumptive patients and other persons living with them, that the sputum (what they cough up) is dangerous, and must be properly disposed of. It should be received in a spit-cup or spittoon containing a little water or disinfecting fluid, and must never be spit upon floors, carpets, or received in handkerchiefs. If a disinfecting solution is used, corrosive sublimate is unsuitable; chloride of lime is efficient but irritates the air passages; carbolic acid with five per cent of tartaric acid or hydrochloric acid, will be the best disinfectant generally available. If, occasionally, it is necessary to have handkerchiefs or cloths soiled with the sputum, they should be boiled as soon as possible, and before drying. The spittoon should be of such shape that the sputum may easily fall into the water without soiling the sides of the vessel. For patients not able to sit up, a small spit-cup with a handle should be used. When flies are present it should be covered. Spit-cups and spittoons should be emptied and cleansed often with boiling water and potash soap. When the house has a drainage system, the contents may be poured down the water-closet or slop-hopper; when it has not, they should be buried in ground which will not be turned up soon. The sputum should not be thrown out upon the surface of the ground near inhabited places, nor on manure heaps, nor where animals may get it, nor where it may soil animal food. Boxes filled with sand or sawdust should not be used. Cheap wooden and pasteboard spit-cups are now on the market, one of which may be burned daily, or oftener, with its contents, as a convenient way of disposing of the sputa. A pocket spit-flask of small size has been devised, which may be used while away from home.

The floors, woodwork, and furniture of rooms in which consumptive patients stay, should be wiped with a damp cloth, not dusted in the usual way. The patient's clothing should be kept by itself, and thoroughly boiled at the washing. The patient should be made to understand that in neglecting these measures he is imperiling his friends and at the same time diminishing very much his own chances of recovery by re-infecting himself with the inhalation of his own dried and pulverized sputum. After a death from this disease has occurred, the patient's room, clothing, and bed should be disinfected. For this purpose boil all bed and personal clothing, or disinfect them, while practicable,

in a steam disinfector; wash furniture, woodwork, walls, and floors with carbolic acid solution and thoroughly expose the rooms to light and air.

If raw milk is used as food, especially if it is to be given to children, an assurance should be had that the cows which produce it are perfectly healthy and subjected to healthful treatment. When there is any doubt as to the health of the cows which furnish the supply, the milk should be boiled before use. Thorough cooking will remove all danger of tuberculosis through the medium of the meat supply.

Tuberculous mothers and those inclined to consumption should, under no conditions, nurse their babies.

TO GUARD AGAINST CONTRACTING THE DISEASE.

By observing the rules which are expressed and suggested in the foregoing, the principal, if not all, danger from infection may be avoided.

Whatever has a tendency to undermine the general health increases the susceptibility to the infection and diminishes the power of recovery from incipient tuberculosis. A fact abundantly shown in the dissecting-room is that many persons, dying of other diseases, have had tuberculosis, and have recovered in its early stages. This tendency to recover is greatly strengthened by the habitual breathing of pure air. Means should be provided for the abundant ventilation of inhabited rooms, particularly of sleeping-rooms, schoolrooms, and churches. The open-air treatment of consumptives, and those who are threatened with tuberculous disease, has given much better results than any other. Particularly in Germany, and to some extent in this country, such treatment has been systematized in "sanitaria" for consumptives. Here the patients have the advantage of a regular life, nutritious food, and such exercise as they can bear without fatigue; but the chief curative agent is an abundance of fresh air. Even in the coldest of winter weather, patients, after a period of gradual habituation, and always guided by the judgment of the physician, pass the whole day walking in the open air or sitting or lying on resting places, wrapped comfortably in blankets. Usually no claim is made for advantages of climate. An abundance of pure air is the all-important thing.

HOW FAR MAY A COW BE TUBERCULOUS BEFORE HER MILK BECOMES DANGEROUS AS AN ARTICLE OF FOOD?*

BY HAROLD C. ERNST, A. M., M. D., OF BOSTON.

The change of opinion in regard to the infectious nature of tuberculosis has been very marked in the last few years, not among the scientists, but among the people at large. Of course the medical world has, as a rule, accepted the conclusions to be drawn from Villemin's work of twenty-five years ago, and the discovery of the specific cause of the disease by Koch has only added strength to the theories advanced in certain quarters before that time. The change of opinion spoken of is, after all, hardly a change, but, more properly, an acceptance of the knowledge gained in regard to the disease by the more recent and exact methods of research, and a much wider diffusion of that knowledge. More and more is it the rule that the knowledge of the transmissibility of tuberculosis by means of infected material is recognized among those whom it concerns the most, and nothing but good can come from the diffusion of that knowledge.

It is hardly too much to say that proper methods of management of tuberculosis, both in human beings and in animals, involve more important interests — pecuniary as well as vital — than any other subject that engages the attention of medical men. It is well known that one seventh of the human race, approximately, perish from this disease, and when we acknowledge to ourselves, as a fair review of the evidence at hand must force us to do, that most, if not all, of this loss is preventable, our duty is plain before us; that is, never to cease speaking of it, never

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to give up trying to reconcile the money interests of man with his own welfare, and to do all in our power, by the collection of clinical and experimental evidence, to make the case complete.

The work showing the etiological relationship of the bacillus of tuberculosis to the disease was, to all intents and purposes, complete upon the publication of Koch's monograph upon the subject. Nothing more in the way of proof was actually needed, and, indeed, very little has been furnished. At the same time, confirmatory evidence was demanded by some who had and many who had not access to the original details, and this confirmatory evidence has been furnished in such overwhelming amount that it is to-day but a waste of time to repeat, what is accepted the scientific world over, that in the organism described by Koch we have the specific cause of this pathological change, and that without its activity we do not have tuberculosis in any form or under any conditions.

An imperfect understanding of the nature of bacteria in general, and of this organism in particular, has led to many attempts to arrest the pulmonary form of the disease it produces, by therapeutic measures, most of which would have been seen to be useless at the outset, if a knowledge of the problem had been complete. It is not upon drugs or mechanical means that our reliance should be placed in attempting to stamp out this scourge of civilized man. Our attention must be turned in the direction of proper preventive measures, and until the necessity for this is impressed upon physicians in general, and by them upon the people at large, so that the preventive measures suggested after mature deliberation will be complied with, but little can be effected, and the knowledge gathered after so much hard labor must be considered as wasted, for the time being.

In order to the suggestions upon which the stamping out of tuberculosis must depend, there is necessary a large amount of investigation into the methods by which it spreads and by which the virus is carried from person to person. Among these methods are undoubtedly the excreta — more especially the sputum — from persons affected with the disease; the excreta are carelessly treated, and scattered broadcast, to the injury of persons susceptible but not previously affected. The methods of distribution

in this way, and the behavior of the bacillus of tuberculosis outside of the body, have been well and recently treated by Cornet (*Zeit. f. Hyg.*, Bd. *v.* S. 191, 1888).

Other methods of distribution are of importance, however, and until within a few years have not received attention from the medical profession at all commensurate with their value. These methods of infection are those arising from the ingestion of food materials coming from the domestic animals, especially the flesh and milk of cattle.

In Koch's Etiology ot Tuberculosis he uses the following expressions:

"Since by far the greatest number ot cases of tuberculosis begin in the lungs, it is to be supposed that the infection in all these cases has taken place in the manner just suggested,— by the inhalation of phthisic sputum dried and made into dust. The second principal source for the tubercle-bacilli, viz., tuberculosis of the domestic animals, appears not to have anything like the importance of the phthisic sputum. The animals, as is well known, produce no sputum, so that during their life no tubercle-bacilli get from them into the outer world by means of the respiratory passages. Also in the excrement of tuberculous animals the bacilli appear to be only exceptionally present. On the contrary, it is a fact that the milk of tuberculous animals can cause infection.

"With the exception of this one way, therefore (i. e., through milk), the tuberculous virus can only have effect after the death of the animal, and can only cause infection by the eating of the meat. The same conditions hold for the milk of cows suffering from 'perlsucht.' Before all things, if infection is to take place, it is necessary that the milk contain tubercle-bacilli; but this appears to be the case only when the milk-glands themselves are affected with the disease. This explains at once the contradictions in the statements of various authors who have made feeding experiments with the milk from cows suffering from 'perlsucht.' If infection from tuberculous animals does not appear to be frequent, it must by no means be underrated."

This caution is one which was necessary at the time it was written, and its repetition is as necessary now as ever. What conclusions may be reached in regard to its extreme importance,

are well shown by the statistics collected and presented by Dr. Brush before the New York Academy of Medicine, on April 29, 1889 (*Boston Medical and Surgical Journal*, cxx. p. 467 *et seq.*). In this paper the author states that after several years of close study of the affection, including a consideration of all accessible statistics, and the habits of the people among whom it prevails, he has arrived at the conclusion that the only constantly associated factor is found in the in-bred bovine species. If a community was closely connected with in-bred dairy cattle, tuberculosis prevailed, and, *vice versa*, if there were no in-bred dairy cattle, there was no tuberculosis. In the discussion following this paper many objections were raised. Dr. Brush went on to say that he believed that the disease was originally derived from the bovine species. He did not believe that less than fifty per cent of all dairy cattle were affected with it, while the statistics he had quoted showed that wherever there was a race of people without cattle, phthisis was unknown. He believed, furthermore, that if all the cattle in this country were to be killed, the disease would finally die out entirely here.

Such statements as these are a revelation to the generality of practitioners, and may seem to be somewhat forced, but they certainly indicate, together with the statistics upon which they are based, the existence of a greater danger than has been fairly realized. That the danger from the consumption of milk coming from cows affected with tuberculosis has been understood by individuals at least, and that, too, before the announcement of Koch's discovery, is very well shown by extracts from a letter which I take the liberty of quoting here. The gentleman writing it is a veterinarian in practice in Providence, R. I., and the observations were made and the advice given more than ten years ago. That portion of his letter bearing upon the subject in hand, is as follows:

"Mr. W., June 15, 1878, called me to see a white and red cow. Coughs, and is short of breath and wheezes. Pulse, 60; respiration 14, and heavy at the flanks; temperature, 104°. Diminished resonance of right lung, but increased in part of the same. Emphysematous crackling over left lung, and dullness on percussion. Diagnosed a case of tuberculosis, and advised the destruction of the animal.

"December 12. Cow in a cold rain a few days ago for about two hours. Milk still more diminished than at a visit made on September 25. Again advised the destruction of the cow. Family still using the milk. Respiration, 20; pulse, 85; temperature, 104.6°.

"February 22, 1879. Temperature, 104.8°; respiration, 26; pulse, 68. Losing flesh fast. Milk still in small quantities. Advised, as before, to destroy the animal and *not to use milk*.

"May 30. Called in a hurry to see cow. Is now as poor as could be. No milk for a week. Pulse, 80; respiration, 40; temperature, 106°. The cow died in about three hours. Autopsy made fourteen hours after death; lungs infiltrated with tuberculous deposit; weight of thoracic viscera, 43.5 pounds; tuberculous deposits found in the mediastinum, in the muscular tissues and in the mesentery, spleen, kidneys, udder, intestines, pleura, and one deposit on the tongue. The inside of the trachea was covered with small tubercles.

"In August, 1879, the baby was taken sick, and died in about seven weeks. On post mortem of the child there was found meningeal tuberculosis,— deposits all over the coverings of the brain, and some in the lung.

"In 1881 a child about three years old died with, as it was called, tuberculous bronchitis. And in 1886, a boy nine years old, who for three or four years had been delicate, died with consumption,— 'quick,' as it was called.

"So far as known, the family on both sides have never before had any trouble of the kind, and the parents were both rugged and healthy people, and so were the grandparents — one now being alive and sixty-eight years old, and the other dead at seventy-eight."

Of course there is much room for criticism, if these cases be quoted as carrying out an exact clinical experiment, and no one can say that the occurrence of the three deaths in the same family was anything more than a coincidence. At the same time it must be acknowledged that they offer very solid suggestions for consideration, and that the light thrown upon the disease by the investigations of recent years, makes the advice of the veterinarian to "kill the cow and stop using the milk" much more sound

than it appeared to the minds of the medical gentlemen who "laughed" at him at the time it was given.

It is my hope within the coming year to collect a series of clinical observations which will be of interest and some service in elucidating the question of how many cases of tuberculosis occur which produce suspicion in the minds of medical or veterinary attendants of having an origin in the milk from infectious cows. It is upon this question of possible danger from the domestic animals — especially cattle — that much recent work has been done, but the subject has been by no means exhausted.

If there is danger to human beings from the widespread existence of tuberculosis among cattle, some sort of restrictive measures must be taken, by means of which this danger can be lessened. At the same time, legislation calling for so much pecuniary loss as would be the case if the present supply of tuberculous cattle were to be destroyed, can only be asked for with a backing of as much carefully gathered scientific evidence as can be obtained, and it is the part of preventive medicine and the experimental method to furnish some of this evidence.

Through the liberality and broad-mindedness of an association of gentlemen in Boston, it is possible to present the results of certain experiments undertaken to determine the question which is expressed in the title of this paper. "How far may a cow be tuberculous before her milk becomes dangerous as an article of food?" is an extremely important point to decide. If it be considered already settled and Koch's dictum be accepted, that there is no danger in the milk if the mammary glands be not affected, then there remains only for the veterinary surgeon to determine the existence of such lesions, and restrictive measures can go no farther. If, however, the milk from cows with no visible lesion of the lacteal tract be shown to contain the specific virus of the disease in a not inconsiderable number of cases, and if this milk be shown to possess the power of producing the tuberculous process upon inoculation in small quantities and in feeding experiments carried out with every possible precaution, then restrictive measures must have a far wider scope, and be carried on from an entirely different standpoint than has heretofore been considered necessary.

It is familiar to most of us that little importance has been attached to this question, — the danger of milk from tuberculous cows with no lesions of the udder, — for the reason that many experiments have been made with negative results, and because *a priori* reasoning would seem to indicate the absence of such danger; because tuberculosis is not a disease like anthrax, in which the specific poison is to be found in all parts of the system and is carried from one place to another by the blood-stream. Koch's assertion that the milk from cows affected with tuberculosis is dangerous only when the udder is involved, appears to be based upon theoretical considerations rather than practical work in this especial direction. It has been widely accepted, however, and the weight of his name has caused the assertion to be repeated many times with but few attempts to verify its correctness.

The increased attention that has been paid to the disease among cattle and the suspicions that have been aroused that tuberculosis among the domestic animals is a more frequent cause of its appearance among men than has been supposed, have made a careful investigation of this point imperatively necessary. With the exception of a few successful experiments by Bollinger (*Deutsch. Zeit. f. Thiermed.*, Bd. XIV., S. 264) and Bang (*Ibid.*, Bd. 11, S. 45, 1885), no evidence of great value is to be adduced. These authors, as well as Tschokke (quoted by Bollinger), bring out isolated cases, showing successful inoculation experiments with the milk from tuberculous cows with no disease of the udders, but the experiments are so few in number that they cannot be accepted as furnishing more than a probability, and extremely critical persons might be justified in ascribing the results to contamination.

Bang (*Congrès pour l' étude de la Tuberculose*, 1, p. 70, 1888) gives new results. Examining twenty-one cases of cows affected with general tuberculosis but with no signs of disease in the udder, he found but two whose milk showed virulent qualities upon inoculation in rabbits. He concludes that since the cows experimented with were in advanced stages of the disease and yet showed such slight virulent properties in their milk, the danger from cows in less advanced stages is much less. And this conclusion he thinks is borne out by experiments with milk drawn from eight women

affected with tuberculosis; specimens were used from all for inoculation and none were found to be virulent. He draws the conclusion, therefore, that it is not necessary to consider all milk dangerous coming from tuberculous cows, but that it should always be *suspected*, because no one can say when the udder will be diseased, and because, without this, the milk from tuberculous cows contains the virus in rare cases.

I shall endeavor to show that it is not at all rare for such milk to contain the virus.

Galtier also (*loc. cit.*, p. 81) has given the result of certain experiments with milk coming from tuberculous cows, but he says that "certain experimenters claim to have established the virulence of milk coming from animals whose udders appeared to be normal and free from any lesions; the greater number, and I am one of them, have merely encountered a virulence in milk after the udder had become tuberculous. However, as a beginning tuberculosis of the udder is an extremely difficult thing to recognize, especially during the life of the animal, the milk should be considered dangerous which comes from any animal affected or suspected of being affected with tuberculosis."

I shall endeavor to show that this view of the case is justified by something more than probabilities.

In the *Deutsch. Arch. für klin. Med.*, Bd. XLIV,, S. 500, Hirschberger reports the results of an experimental research upon the infectiousness of the milk of tuberculous cows, in which, following out Bollinger's work, he attempts to settle: 1. Whether the cases are rare in which tuberculous cows give an infectious milk; and 2. Whether the milk is infectious only in cows with general tuberculosis, or whether it is also infectious when the disease is localized. He made the trials of the infected milk by injection into the abdominal cavity of guinea pigs with the usual precautions. His results were as follows:

1. Milk was used five times from cows affected with a very high degree of general tuberculosis in all the organs.

2. Milk was used six times from cows with only a moderate degree of disease.

3. Milk was used nine times from cows in which the disease was localized in the lung.

From these twenty cases the milk was proven to be infectious

in eleven. The percentage of positive results in the animals when arranged in accordance with the three groups above given was eighty per cent in the first group (milk from cows in a very advanced stage of the disease), sixty-six per cent in the second group, and thirty-three per cent in the third. He found the bacilli in only one of the specimens of the milk, and considers that this, therefore, shows that the inoculation experiments are the more certain guide as to whether the milk is infectious or not.

These results are extremely interesting, although they do not lay as much stress as do mine upon the presence or absence of lesions of the lacteal tract.

The experiments which I am able to report * have been made possible by the liberality of the Massachusetts Society for Promoting of Agriculture, which became interested in the question some time ago and has put it in my power to carry them on. They have given everything in the way of pecuniary and moral support that the work has required; my own part has been that of general director, and I have had associated with me during the whole time the Society's veterinarian, Austin Peters, D. V. S. For the last year I have also had the very valuable aid of Dr. Henry Jackson and Langdon Frothingham, M. D. V.

All of the inoculation experiments and most of the microscopic work have been done in the bacteriological laboratory of the Harvard Medical School, some of the microscopic work at the society's laboratory in Boston, while the feeding experiments have been done and the experimental animals have been kept at a farm in the country devoted to this especial purpose, and situated among the healthiest possible surroundings. Nothing has been set down as the result of microscopic observation that I have not myself verified, and every portion of the work has been carried out under the most exacting conditions and with every possible precaution against contamination.

Before the farm buildings were used at all they were thoroughly cleaned from top to bottom. Every portion of old manure was carted away, as well as all the old earth. The whole of the woodwork was scrubbed and then washed with corrosive sublimate solution (1 : 1000) and finally whitewashed, and every care was

* The full notes of these experiments will be found in the Transactions of the Association of American Physicians, Vol. IV., 1889.

taken to secure good drainage and free ventilation. The result and effectiveness of all this have been best demonstrated by the fact that every animal brought to the place made a most marked improvement in its general condition, while some of them even went so far as to appear to get well.

In deciding whether the milk from any cow affected with tuberculosis is dangerous when the udder shows no lesion, the first point is to see whether the milk contains the infectious principle or not. In this case, of course, that infectious principle is the bacillus of tuberculosis, and attention was turned to that for some time. The observations have been carried on over a long space of time, and were made as follows: The milk was taken from the cow in the morning, — or evening, as the case might be, — the udders and teats having just been thoroughly cleansed. The receptacle was an Erlenmeyer flask, stoppered with cotton-wool and thoroughly sterilized by heat. The specimen was taken at once to the laboratory, there placed in conical glasses, with ground-glass covers, the whole of these having been carefully cleansed beforehand, and then allowed to stand in a clean refrigerator for twenty-four to forty-eight hours and sometimes for seventy-two hours. At the end of that time from ten to twenty cover-glass preparations were made from various parts of the milk or cream. These were stained after Ehrlich's twenty-four-hour method, with fuchsin and methylene blue as a contrast color, and then searched with an immersion lens.

We prepared for examination in the way spoken of above one hundred and seventeen sets of cover-glasses from as many different samples of milk. Of these specimens three spoiled, i. e., turned sour or acid before the examination was completed, and must be rejected, leaving, therefore, one hundred and fourteen samples of milk of which the examination was completed. These samples were obtained from thirty-six different cows, all of them presenting more or less distinct signs of tuberculosis of the lungs or elsewhere, but none of them having marked signs of disease of the udder of any kind.

Of these samples of milk there were found *seventeen* in which the bacilli of tuberculosis were distinctly present; that is to say, the *actual virus was seen in* 14.9 per cent of the samples examined (17 : 114 = 14.9). These seventeen samples of infectious

milk came from ten different cows, showing a percentage of *detected* infectiousness of 27.7 per cent (10 : 36 = 27.7). These results are exceedingly interesting, it seems to me, and I confess I am surprised at the size of the percentage named. Not because I had not expected to find the bacilli, — I have been convinced for several years that persistent search would show their presence in such cases as those that are here recorded, — but because the amount of dilution to which the organisms must be subjected diminished immensely the chance of their being found at all. In no case have they been seen in large numbers, but equally in no case has a diagnosis been made where there was the slightest doubt of the appearances under the microscope.

The large number of cases in which these organisms have been found seem to me to indicate their presence in a still greater proportion of cases, if only a sufficiently thorough examination of all the milk could be made. This of course is out of the question, but the results here given seem to establish, beyond a doubt, the fact that milk coming from cows with no definite lesion of the udder may contain the infectious principle of tuberculosis, if the disease be present in other portions of the body of the animal. Also, that this presence of the infectious principle is not merely a scientific possibility but an actual probability, which we should be thoroughly aware of and alive to.

Other interesting facts shown are these: that the cream after rising is quite as likely to be infectious as the milk, because the bacilli were found in the milk nine times after the cream had risen, and in the cream eight times after it had separated from the milk.

In regard to the constancy of the occurrence of the bacilli in the milk, in two of the ten cows in whose milk the bacilli were found, but one sample of the milk was examined; and the bacilli were found in one sample out of several examined at different times, in two cases. In the remaining six cows, bacilli were found two or more times in different samples of the milk. So that, as far as they go, these results seem to indicate that the bacilli are present with a fair degree of constancy. At the same time it should not be surprising if one examination was successful and others failed, because of the chances against success, owing to dilution, which were spoken of above.

In nine of the seventeen cases the time of the milking and the portion of the milk used were noted; that is to say, a sample was taken from the first of the milking, or the last of the milking, and then cover-glasses made from the milk or cream. In these cases bacilli were found in the cream three times, and in the milk four times, from the first of the milking; in samples from the last of the milking, in the cream no times, and in the milk four times; and this too seems to show an interesting point, viz.: that the bacilli, if present at all in the udder, are not washed out entirely by the first manipulations of the teats, but may be supposedly present in any portion of the milk. The converse is also indicated, that the manipulation of the udder in the process of milking does not express the bacilli from the tissue into the latter portion of the milk, but that, as before, they may be supposed to be pretty evenly distributed in all parts of the udder if they be present at all.

Before going on to consider the results of the inoculation experiments made with various specimens of milk, it may be well to glance at the condition of the cows that have been under our control from the time of the beginning of the experiments until they were killed, or until the date of preparing this paper.

The history of each cow, as far as we have been able to secure it, bears out our assertion,— as far as the examinations have gone, that none of the udders were affected with tuberculosis,— certainly so far as gross appearances were concerned. This was true, also, in the microscopic appearance of every case but one (No. 6, cow F). In this case the gross appearances in the udder were healthy, except that one quarter seemed to be slightly fibrous, and there were one or two yellow spots which were seen to be made up of fat under the microscope. With a low power lens only a slight increase of fibrous tissue was observable, and the oil-immersion was put on merely as a matter of routine. One giant cell was discovered containing a number of bacilli, but a careful search failed to show any others, or any signs of change, except the increase of fibrous tissue noted above. So that the assertion is still true, that we have failed to discover any signs of tuberculosis that were easily recognizable in any of the cows here recorded, and these include all we have had under closer observation.

Those from which milk was used for inoculations that are not here given had no signs that permitted of even a probable diagnosis by skilled veterinarians.

We also made an interesting series of experimental inoculations in rabbits and guinea pigs with milk or cream from various cows, in varying quantities and at different times. Of rabbits there were used fifty-seven animals. Of these, five were inoculated with milk which had turned sour, two died of intercurrent diseases in a few days (coccidium oviform), and of one the material was lost before the microscopic examination was completed — so that eight animals are to be rejected, leaving forty-nine upon which the results can be based. Out of these, five were made more or less tuberculous, as proven by microscopic examination, and in forty-four the results were negative; that is to say, we obtained 5-49, or 10.2 per cent of successes out of all inoculations in rabbits.

There were used thirty-three different specimens from thirteen different cows — that is, there were 23 per cent (3 : 13) successful results from the cows used, and 15.5 per cent (5 : 33) successful results from the specimens used.

Positive results were obtained from

Cow P twice (at different times).

Cow L once.

Saunders cow twice (at different times).

The results of the inoculations of guinea pigs are more striking. There were sixty-five animals used in all. Of these, nine were inoculated with sour milk or cream, and two died in a day or two of other diseases (peritonitis and pleurisy). There are, therefore, but fifty-four that should be counted. In them there were twelve positive results, or 28.57 per cent (12 : 42) successes out of all the inoculations. There were used thirty-two specimens from fourteen different cows, and the successful results came from six different cows; that is, 42.8 per cent (6 : 14) of the cows were shown in this way to have infectious milk, and 37.5 per cent (12 : 32) of the specimens used weres hown to have active infectious properties.

Positive results were obtained from

Cow P (three times in two different inoculations).

Cow D (three times in three different inoculations).
Cow F (once).
Slocum cow (once).
Saunders cow (once).
Mayhew cow (three times in two different inoculations).

The combining of the results obtained from both rabbits and guinea pigs shows the following: Successful results were obtained in milk from cow P three times (two different specimens) in guinea pigs, and twice in rabbits (two specimens); from cow L once in rabbits; from cow O three times (three different specimens) in guinea pigs; from cow F once in guinea pigs; from the Slocum cow once in guinea pigs; from the Saunders cow once in guinea pigs, and twice in rabbits (two different specimens); and from the Mayhew cow three times in guinea pigs (two different specimens); that is to say, out of fourteen cows used the milk was shown to be infectious in seven, or 50 per cent, by inoculation experiments.

An interesting fact is also shown, and that is, that bacilli were found in the milk or cream, and successful inoculation experiments made in animals with the same specimen in five different cases (including eight of the successful ones) as follows:

COMPARISON OF THE DATES WHEN BACILLI WERE FOUND IN THE MILK, AND THE SAME MILK WAS USED FOR SUCCESSFUL INOCULATION EXPERIMENTS.

Cow.	Positive.		
	Cover-glass.	Guinea pig.	Rabbit.
P	Cream, A. M.	Cream, A. M. Mar. 9, '89	Cream, A. M., Mar. 9, '89
	Cream, P. M.	Cream, P. M. Mar. 9, '89 Cream, P. M. Mar. 9, '89	Cream, P. M., Mar. 9, '89
O	First of milking, cream, March 9, 1889	First of milking, cream, March 9, 1889	
Slocum	Last of milking	Last of milking, June 10, 1889	
Mayhew	Last of milking, milk	Last of milking, milk, June 21, 1889	

The inoculation experiments above detailed seem to me to be deserving of consideration because they were done under the most careful precautions that could be devised. In all cases the

experiment animals were kept under observation long enough to determine, so far as could be seen, that they were in good health, and after the inoculations they were separated and kept under close watch, but in healthy surroundings. Some of those that were used were inoculated immediately after purchase, because of a scarcity of supply at the farm, and were not in good condition. But as no sign of tuberculosis appeared in any of these, their ill health cannot come in as a disturbing factor in the results.

The results obtained from certain feeding experiments with calves show that there were thirteen calves used, and fed for varying lengths of time with milk from cows affected with tuberculosis, but not of the udder. Of these, the material was thrown away from one before the microscopic examination, and this should be rejected in the final results. Of the remainder there were five positive results obtained and one suspicious. The latter is counted as negative, for the reason that, although giant cells and granulation tissue were seen, no bacilli were found. There were, therefore, five out of twelve positive results, or 41.66 per cent. It should also be said, that of those counted as negative three sets of specimens were suspicious, but were hastily examined for the purposes of this paper, so that a more careful search may very probably increase the percentage of successes.

In the series of feeding experiments on one set of pigs, the milk being given to them from the same cows as before, there were seven pigs used in all, from one litter and healthy parents. Of these, examination showed negative results in two, positive results in two, one was subjected to a very hasty microscopic examination, and the material from two was thrown away — a mistake, as was shown by the results of the microscopic examination of the material from No. 3. There are to be counted, therefore, only five, giving as successful results 40 per cent.

By the cover-glass examinations we have shown that the milk contains infectious material in ten cows out of thirty-five from which the milk was examined for bacilli, that is, in 28.57 per cent. We have also shown that the milk was infectious, by inoculation experiments, in seven out of fourteen of the cows from which the milk came, that is, 50 per cent. And we have

shown the infectious nature of the milk by ocular demonstration and successful inoculation from the same specimens in five cows out of fourteen used, or, 35.7 per cent.

These results are, to a certain extent, preliminary; that is to say, they are but part of the work upon this subject which is being done under the auspices of the Massachusetts Society for the Promotion of Agriculture. The work will not be completed, at any rate, until next year.

They show, however:

1. And emphatically, that the milk from cows affected with tuberculosis in any part of the body may contain the virus of the disease.

2. That the virus is present whether there is disease of the udder or not.

3. That there is no ground for the assertion that there must be a lesion of the udder before the milk can contain the infection of tuberculosis.

4. That, on the contrary, the bacilli of tuberculosis are present and active in a very large proportion of cases in the milk of cows affected with tuberculosis but with no discoverable lesion of the udder.

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EXPENSES.

The following is a statement of the expenses of the Board for the financial year ending May 31, 1889, chargeable to the annual appropriation:

Salary of secretary	$2,000.00
Salary of clerk	500.00
Expenses of the Board, including traveling expenses of members, analysis of water, extra printing, additions to library, office accessories, etc.	858.29
Total	$3,358.29

The above includes, also, all expenses for labor and clerical work in the registration of vital statistics for the State, but does not embrace the printing of report or postage account.

The epidemic fund stands as reported one year ago, to wit:

Appropriated in 1885	$5,000.00
Expended in 1885–86	260.50
Balance in hands of state treasurer	$4,739.50

Respectfully submitted.

IRVING A. WATSON,

Secretary.

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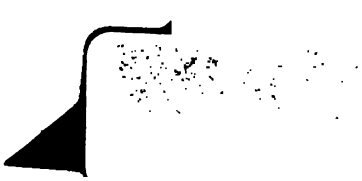
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